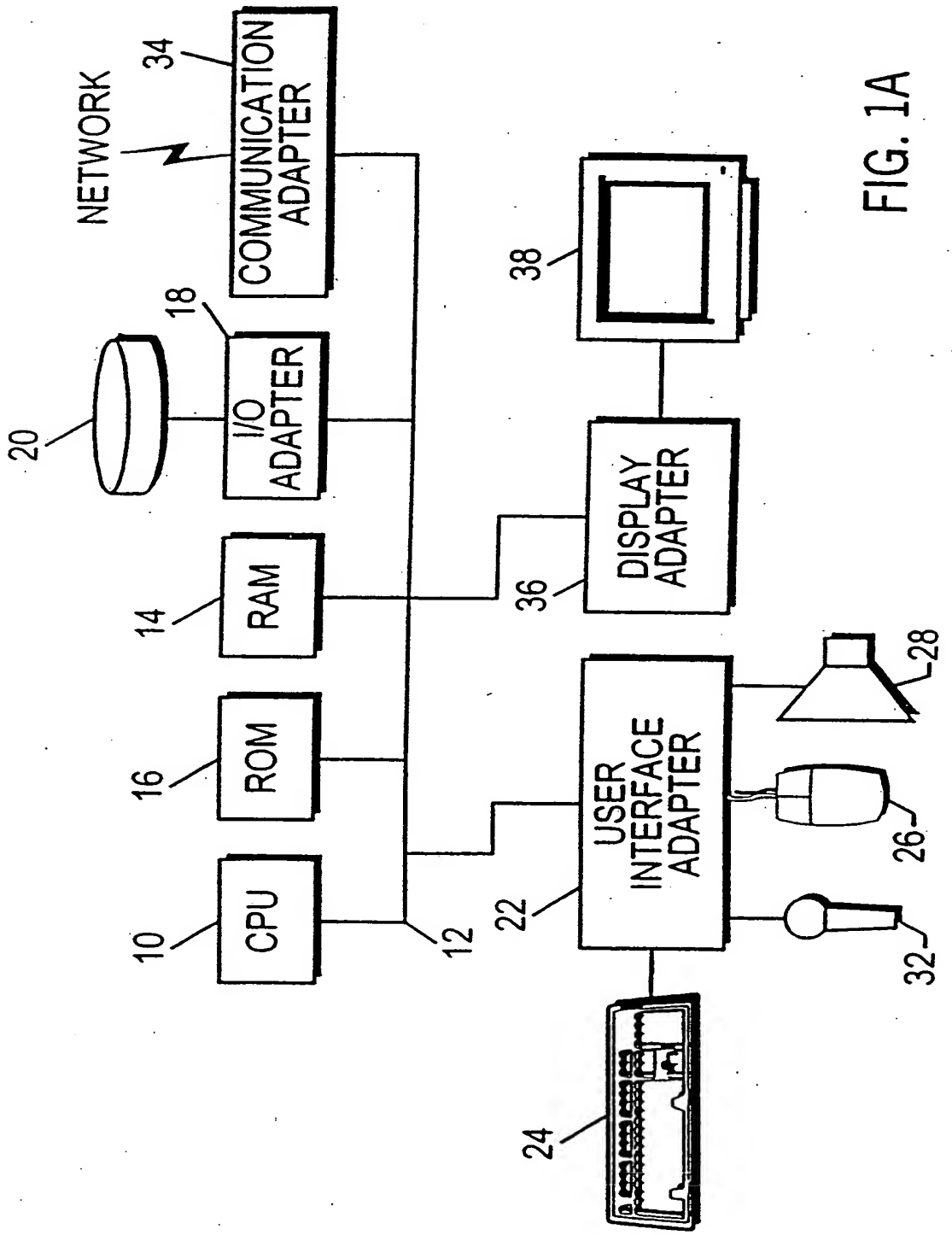

NETWORK
34
COMMUNICATION ADAPTER
18
I/O ADAPTER
20
RAM
14
ROM
16
CPU
10
12
38
DISPLAY ADAPTER
36
USER INTERFACE ADAPTER
22
28
26
32
24

FIG. 1A

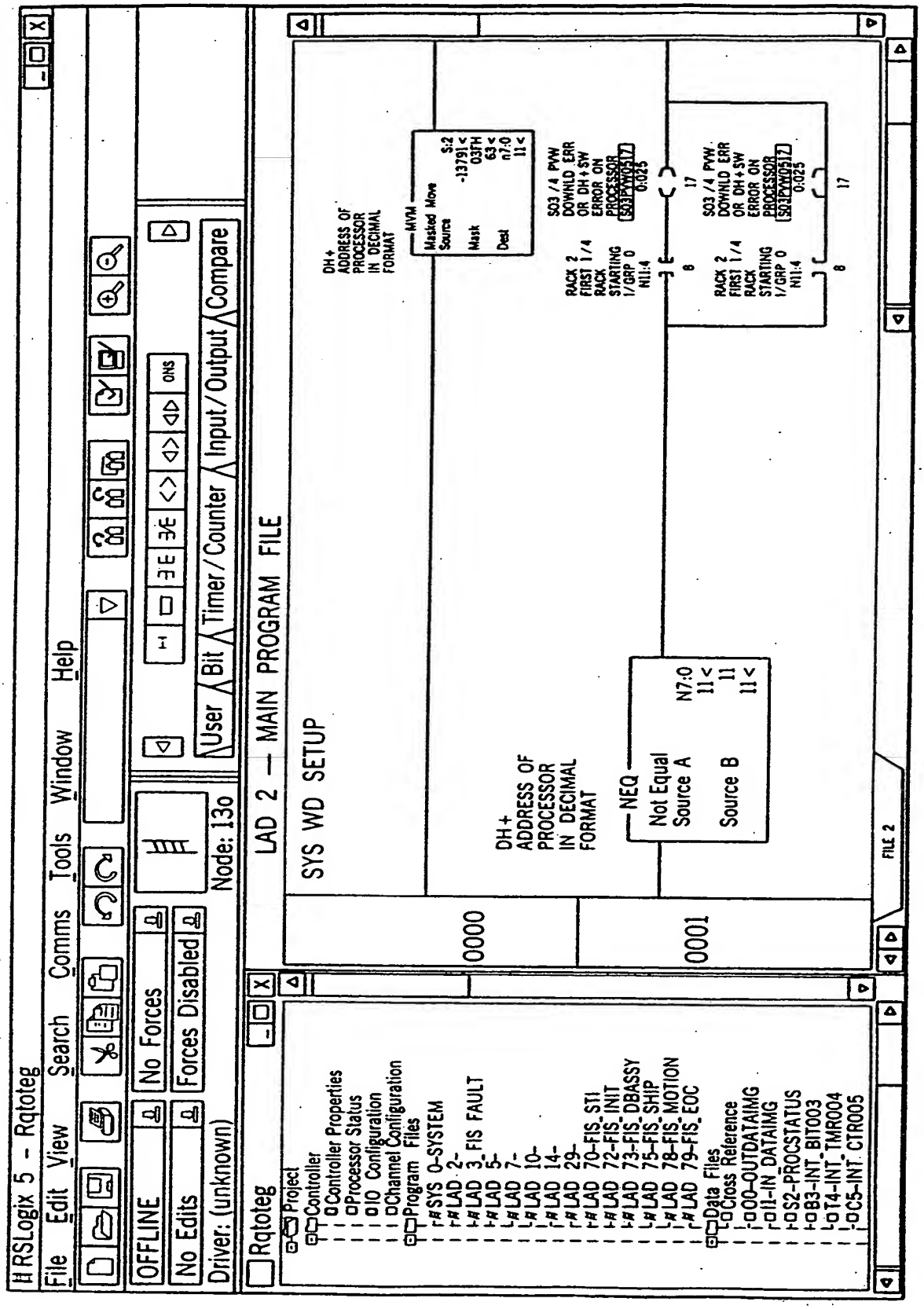

RSLogix 5 - Rqtoteg
File Edit View Search Comms Tools Window Help
OFFLINE
No Edits
Driver: (unknown)
No Forces
Forces Disabled
Node: 130
User Bit Timer/Counter Input/Output Compare
Rqtoteg
Project
Controller
Controller Properties
Processor Status
IO Configuration
Channel Configuration
Program Files
SYS 0-SYSTEM
LAD 2-
LAD 3_FIS FAULT
LAD 5-
LAD 7-
LAD 10-
LAD 14-
LAD 29-
LAD 70-FIS_STI
LAD 72-FIS_INIT
LAD 73-FIS_DBASSY
LAD 75-FIS_SHIP
LAD 78-FIS_MOTION
LAD 79-FIS_EOC
Data Files
Cross Reference
O0-OUTDATAIMG
I1-IN_DATAIMG
S2-PROCSTATUS
B3-INT_BIT003
T4-INT_TMR004
C5-INT_CTR005
LAD 2 — MAIN PROGRAM FILE
SYS WD SETUP
0000
DH+ ADDRESS OF PROCESSOR IN DECIMAL FORMAT
NEQ
Not Equal
Source A
N7:0
11<
Source B
11<
0001
DH+ ADDRESS OF PROCESSOR IN DECIMAL FORMAT
MVM
Masked Move
Source
S:2
-13791 <
Mask
03FH
Dest
63 <
n7:0
11<
RACK 2 FIRST 1/4 RACK STARTING 1/GRP 0
N11:4
8
17
S03 /4 PVW DOWNLD ERR OR DH+SW ERROR ON PROCESSOR
0:025
FILE 2

FIG. 1B

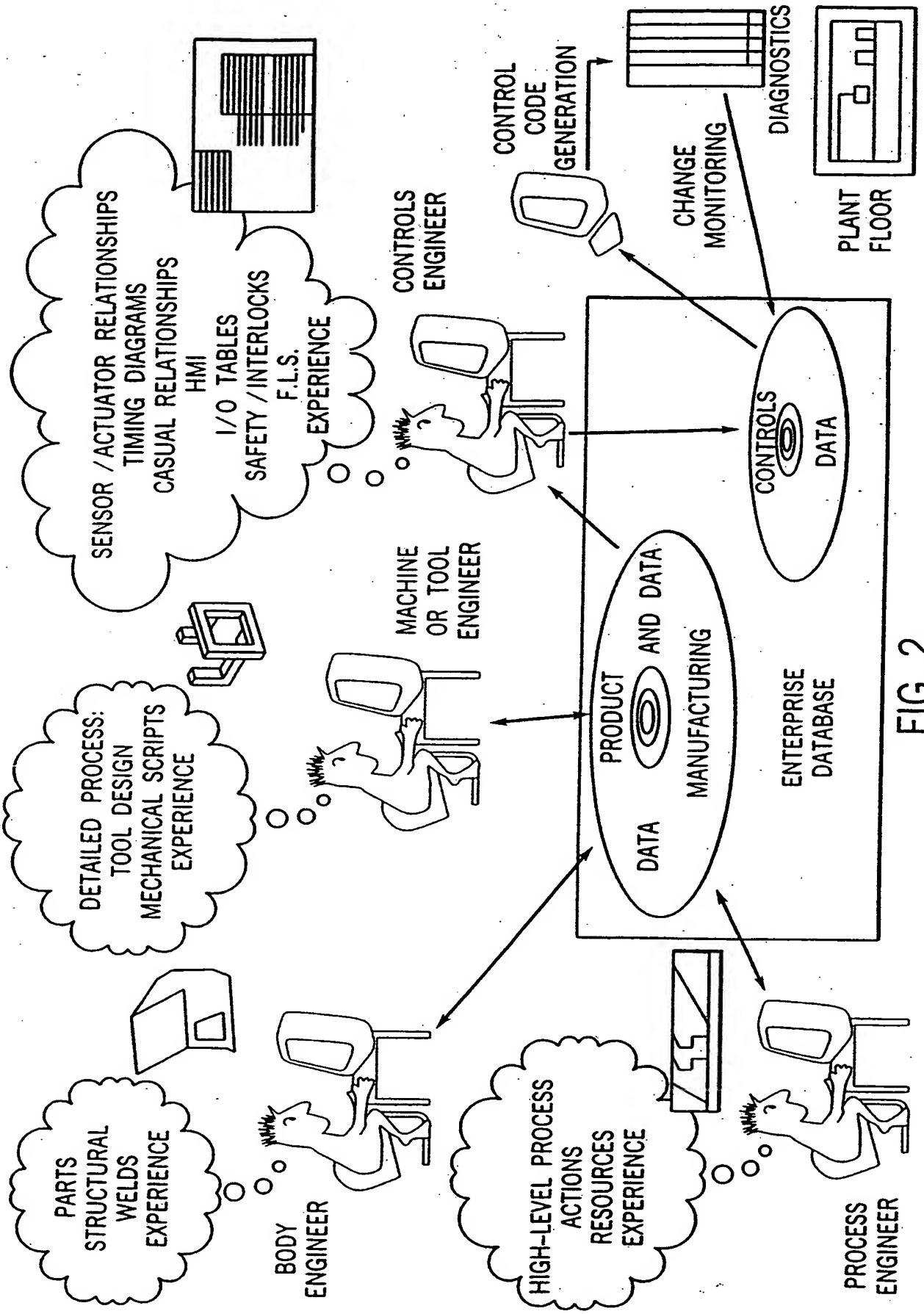

SENSOR /ACTUATOR RELATIONSHIPS
TIMING DIAGRAMS
CASUAL RELATIONSHIPS
HMI
I/O TABLES
SAFETY /INTERLOCKS
F.L.S.
EXPERIENCE
CONTROLS ENGINEER
CONTROL CODE GENERATION
CHANGE MONITORING
DIAGNOSTICS
PLANT FLOOR
CONTROLS DATA
DETAILED PROCESS:
TOOL DESIGN
MECHANICAL SCRIPTS
EXPERIENCE
MACHINE OR TOOL ENGINEER
PRODUCT AND DATA MANUFACTURING DATA
ENTERPRISE DATABASE
PARTS
STRUCTURAL
WELDS
EXPERIENCE
BODY ENGINEER
HIGH-LEVEL PROCESS
ACTIONS
RESOURCES
EXPERIENCE
PROCESS ENGINEER

FIG. 2

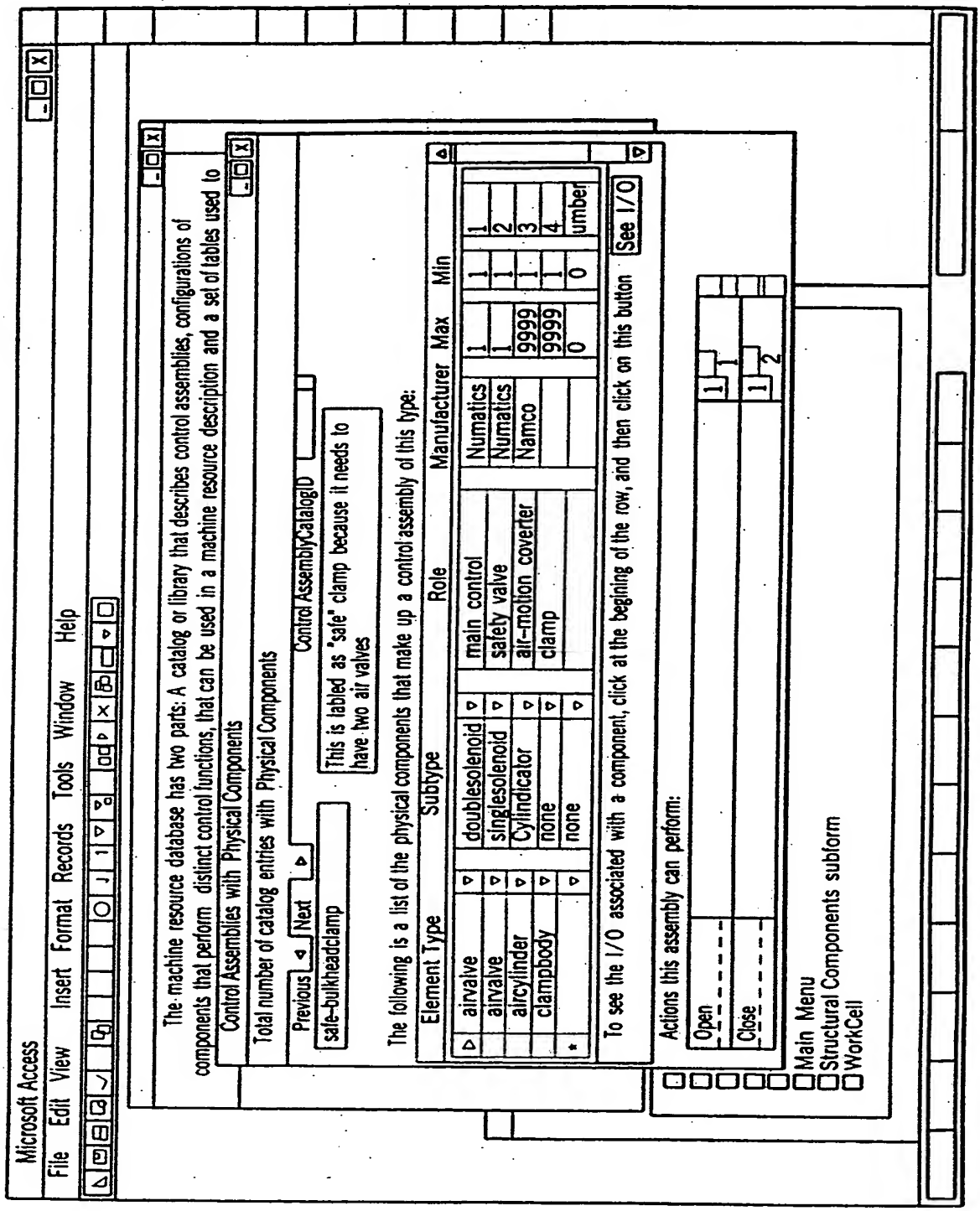
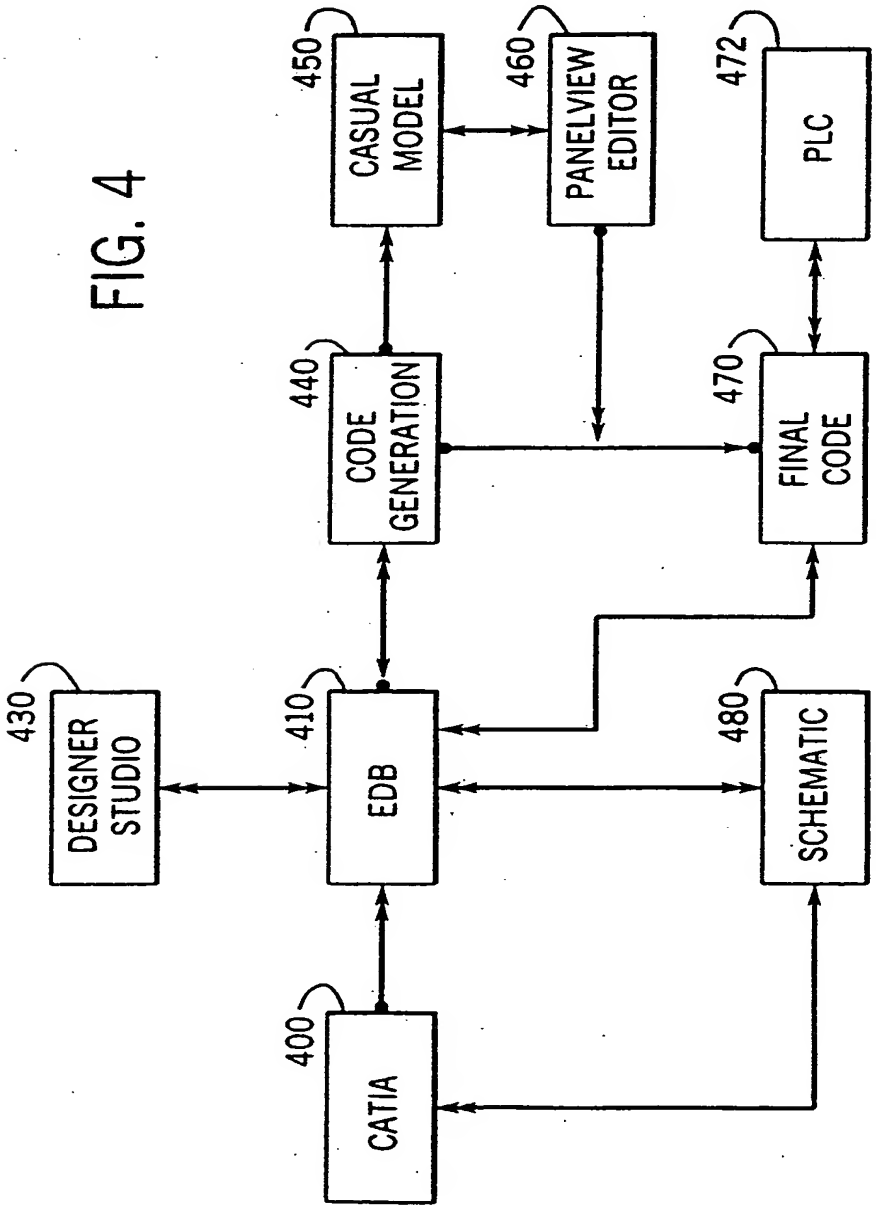

Microsoft Access
File Edit View Insert Format Records Tools Window Help
The machine resource database has two parts: A catalog or library that describes control assemblies, configurations of components that perform distinct control functions, that can be used in a machine resource description and a set of tables used to
Control Assemblies with Physical Components
Total number of catalog entries with Physical Components
Previous
Next
Control AssemblyCatalogID
safe-bulkheadclamp
This is labled as "safe" clamp because it needs to have two air valves
The following is a list of the physical components that make up a control assembly of this type:
Element Type
Subtype
Role
Manufacturer
Max
Min
airvalve
doublesolenoid
main control
Numatics
1
1
airvalve
singlesolenoid
safety valve
Numatics
1
1
aircylinder
Cylindicator
air-motion coverter
Namco
9999
1
clampbody
none
clamp
9999
1
none
0
0
To see the I/O associated with a component, click at the begining of the row, and then click on this button
See I/O
Actions this assembly can perform:
Open
Close
Main Menu
Structural Components subform
WorkCell

FIG. 3

FIG. 4


450
CASUAL MODEL
460
PANELVIEW EDITOR
472
PLC
440
CODE GENERATION
470
FINAL CODE
430
DESIGNER STUDIO
410
EDB
480
SCHEMATIC
400
CATIA

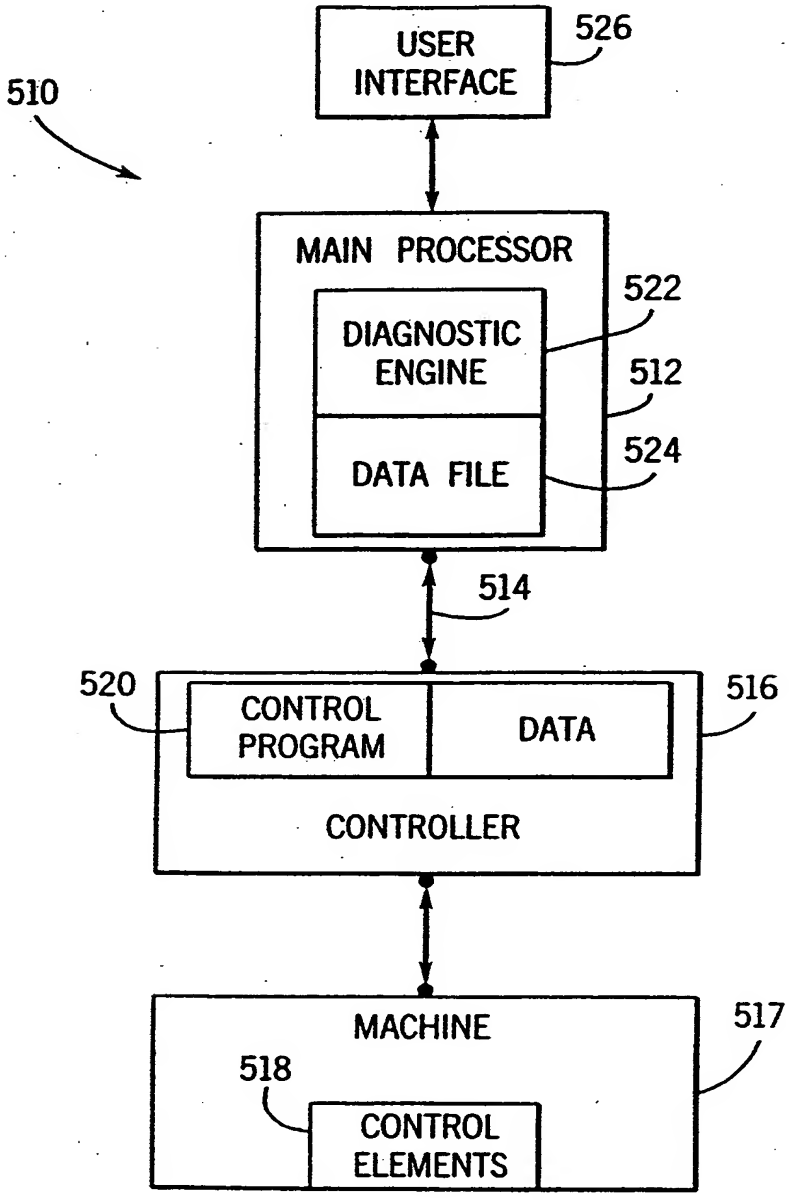

510
USER INTERFACE
526
MAIN PROCESSOR
DIAGNOSTIC ENGINE
522
512
DATA FILE
524
514
520
CONTROL PROGRAM
DATA
516
CONTROLLER
MACHINE
517
518
CONTROL ELEMENTS

FIG. 5A

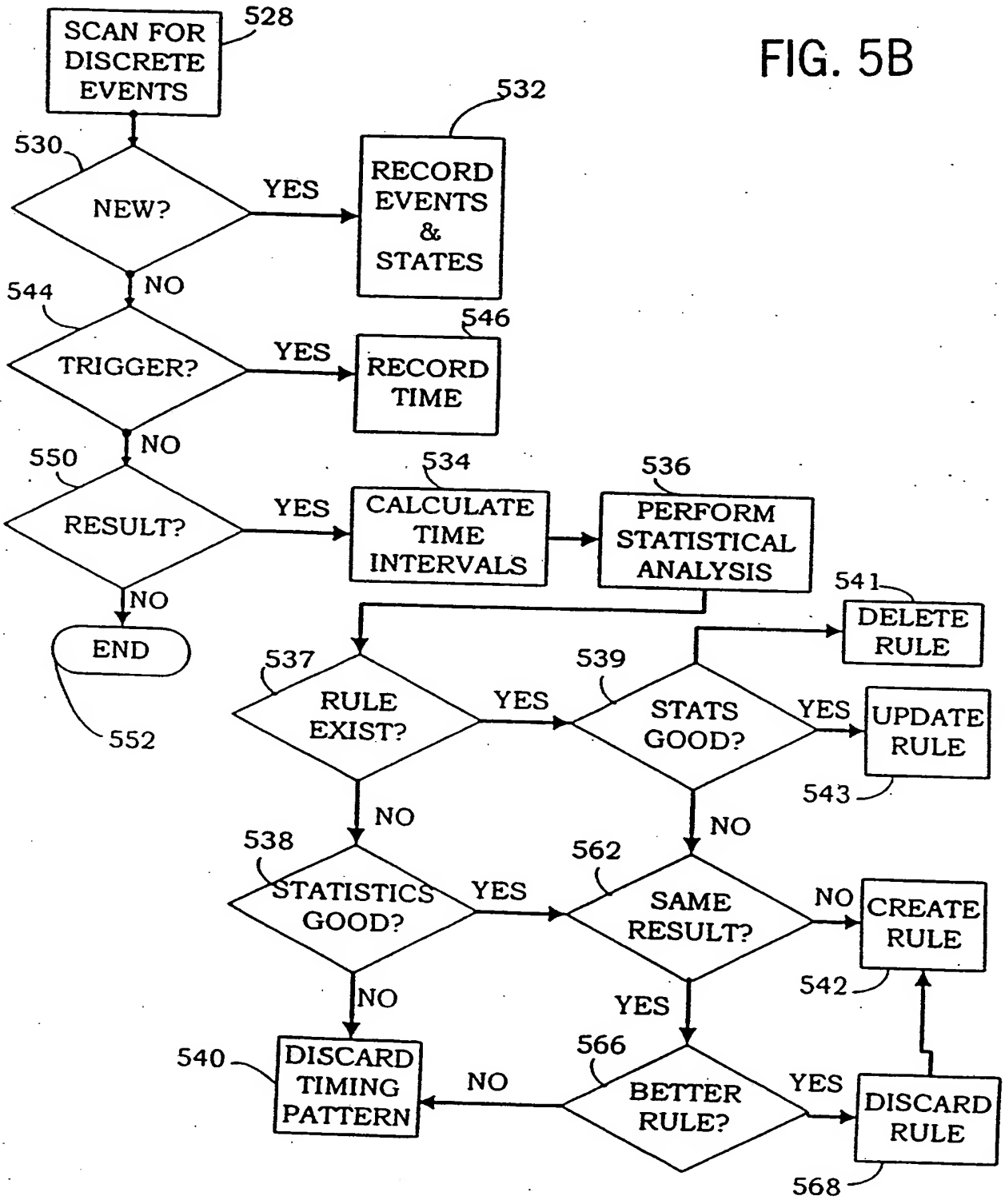
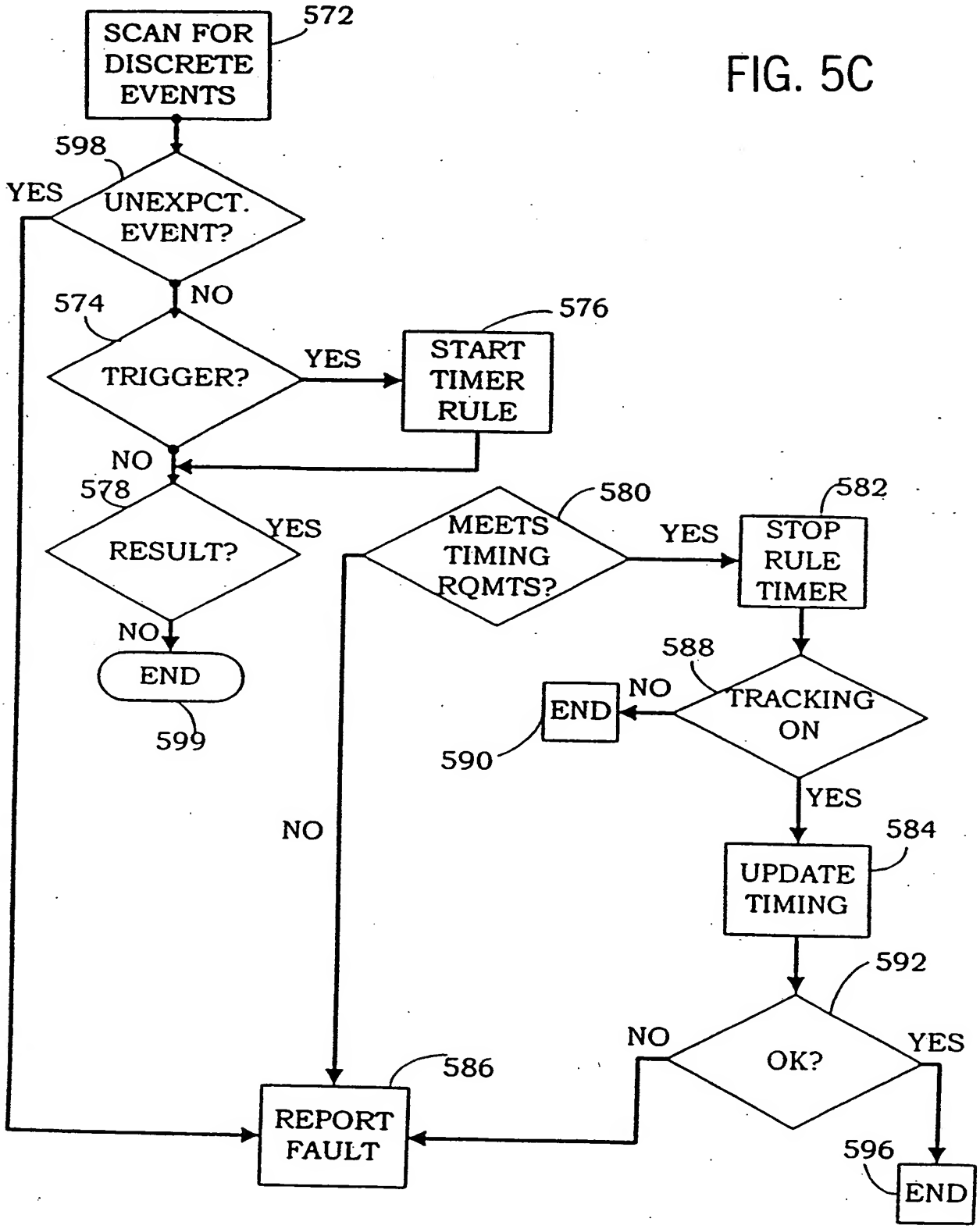

SCAN FOR DISCRETE EVENTS
528
NEW?
530
YES
RECORD EVENTS & STATES
532
NO
TRIGGER?
544
YES
RECORD TIME
546
NO
RESULT?
550
YES
CALCULATE TIME INTERVALS
534
PERFORM STATISTICAL ANALYSIS
536
NO
END
552
DELETE RULE
541
RULE EXIST?
537
YES
STATS GOOD?
539
YES
UPDATE RULE
543
NO
NO
STATISTICS GOOD?
538
YES
SAME RESULT?
562
NO
CREATE RULE
542
NO
YES
DISCARD TIMING PATTERN
540
NO
BETTER RULE?
566
YES
DISCARD RULE
568

FIG. 5B

FIG. 5C


SCAN FOR DISCRETE EVENTS
572
598
UNEXPCT. EVENT?
YES
NO
574
TRIGGER?
YES
576
START TIMER RULE
NO
578
RESULT?
YES
NO
END
599
580
MEETS TIMING RQMTS?
YES
582
STOP RULE TIMER
588
TRACKING ON
NO
END
590
YES
584
UPDATE TIMING
592
OK?
NO
YES
586
REPORT FAULT
596
END

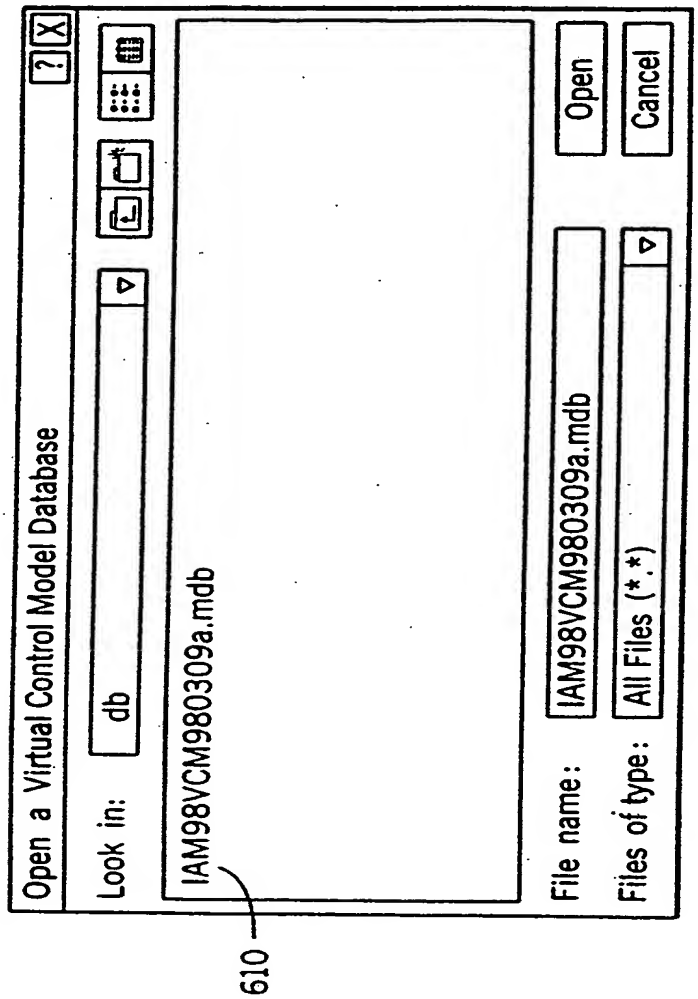
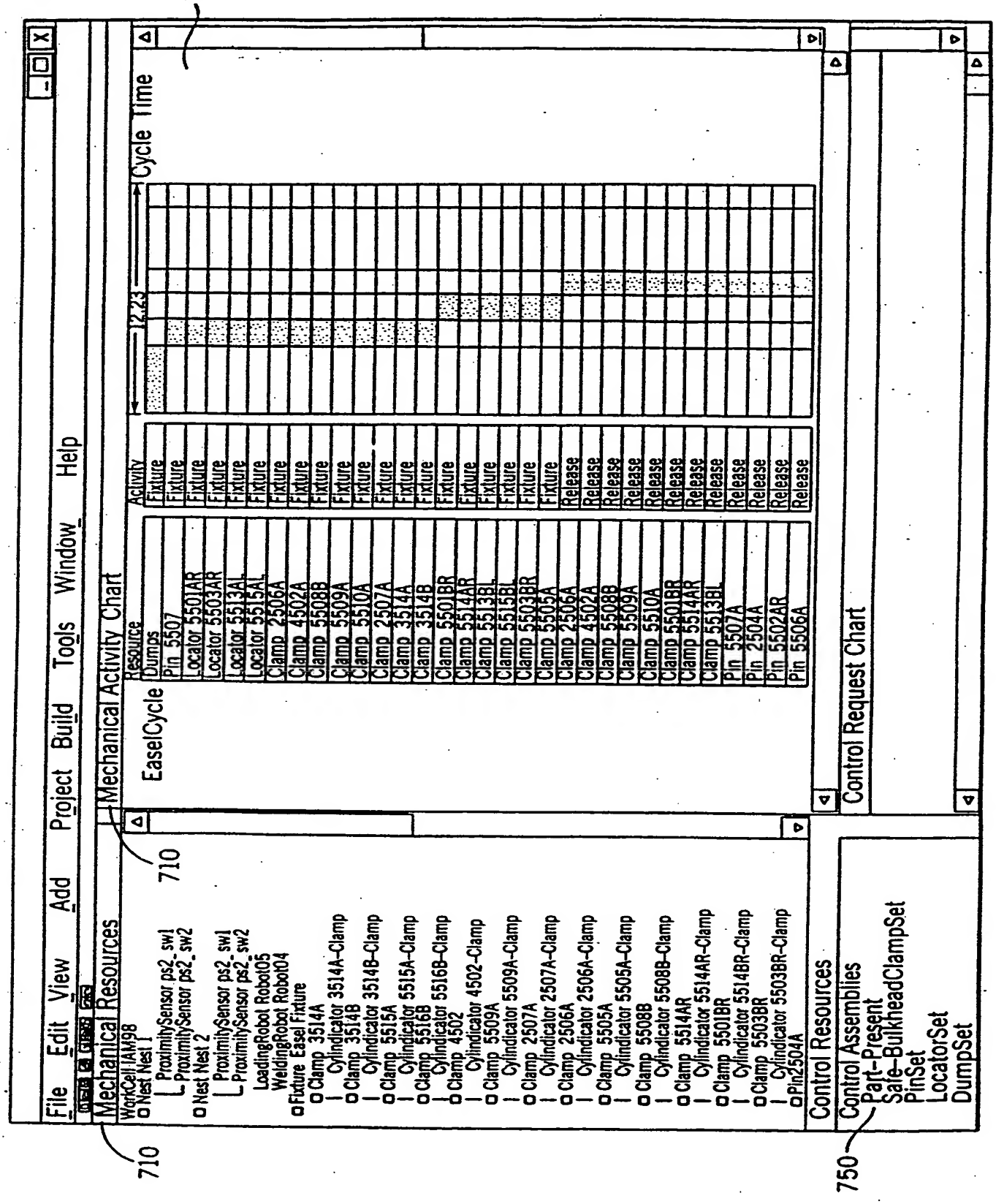

Open a Virtual Control Model Database
Look in:
db
IAM98VCM980309a.mdb
610
File name:
IAM98VCM980309a.mdb
Open
Files of type:
All Files (*.*)
Cancel

FIG. 6

FIG. 7


File Edit View Add Project Build Tools Window Help
Mechanical Activity Chart
Mechanical Resources
WorkCell IAM98
Nest Nest 1
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
Nest Nest 2
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
LoadingRobot Robot05
WeldingRobot Robot04
Fixture Easel Fixture
Clamp 3514A
Cylindicator 3514A-Clamp
Clamp 3514B
Cylindicator 3514B-Clamp
Clamp 5515A
Cylindicator 5515A-Clamp
Clamp 5516B
Cylindicator 5516B-Clamp
Clamp 4502
Cylindicator 4502-Clamp
Clamp 5509A
Cylindicator 5509A-Clamp
Clamp 2507A
Cylindicator 2507A-Clamp
Clamp 2506A
Cylindicator 2506A-Clamp
Clamp 5505A
Cylindicator 5505A-Clamp
Clamp 5508B
Cylindicator 5508B-Clamp
Clamp 5514AR
Cylindicator 5514AR-Clamp
Clamp 5501BR
Cylindicator 5514BR-Clamp
Clamp 5503BR
Cylindicator 5503BR-Clamp
Pin2504A
Control Resources
Control Assemblies
Part-Present
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
EaselCycle
Resource
Dumps
Pin 5507
Locator 5501AR
Locator 5503AR
Locator 5513AL
Locator 5515AL
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5510A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Clamp 5501BR
Clamp 5514AR
Clamp 5513BL
Clamp 5515BL
Clamp 5503BR
Clamp 5505A
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5510A
Clamp 5501BR
Clamp 5514AR
Clamp 5513BL
Pin 5507A
Pin 2504A
Pin 5502AR
Pin 5506A
Activity
Fixture
Release
Cycle Time
12.23
Control Request Chart
710
720
750

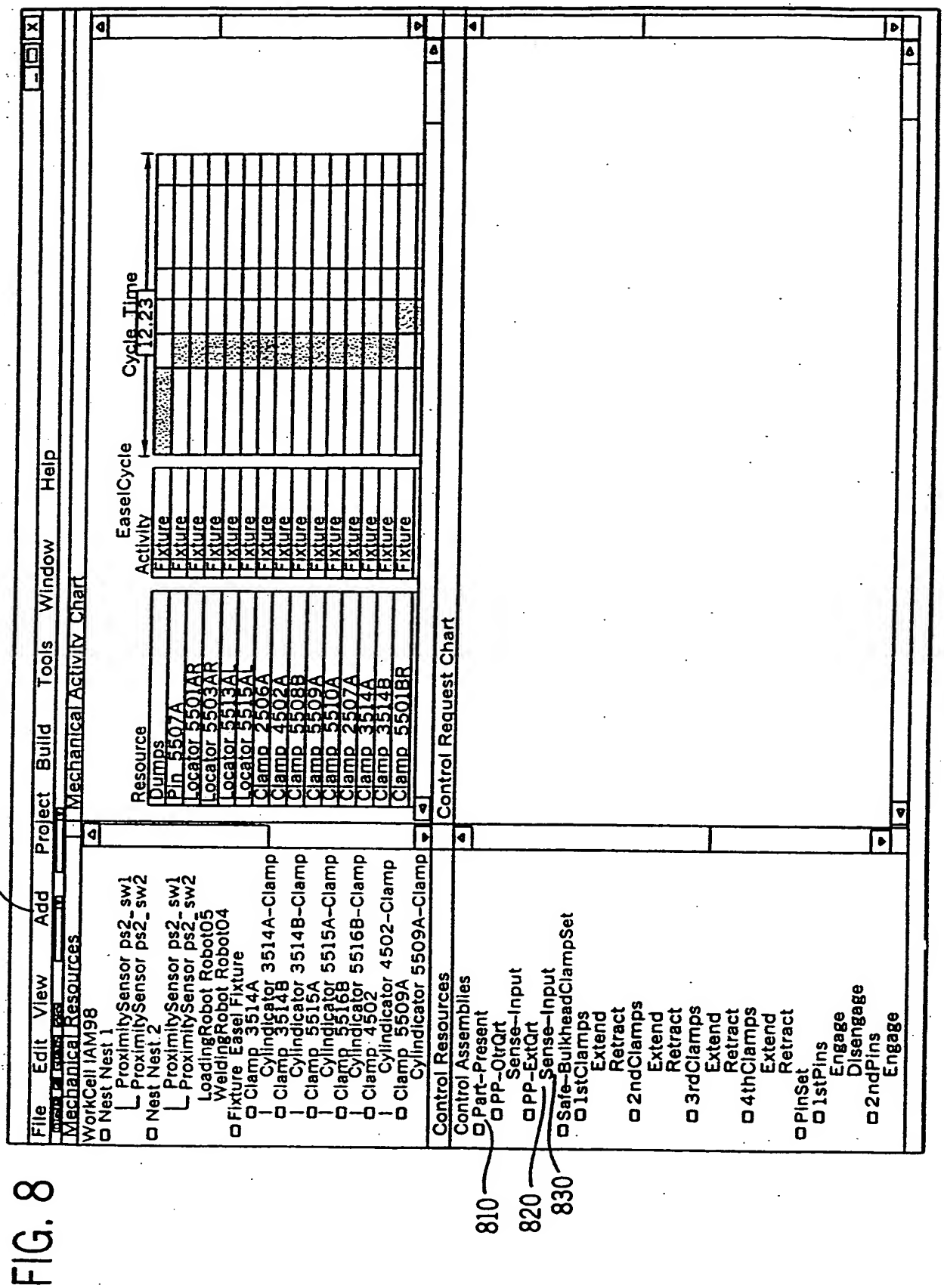

840
File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Activity Chart
WorkCell IAM98
Nest Nest 1
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
Nest Nest 2
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
LoadingRobot Robot05
WeldingRobot Robot04
Fixture Easel Fixture
Clamp 3514A
Cylindicator 3514A-Clamp
Clamp 3514B
Cylindicator 3514B-Clamp
Clamp 5515A
Cylindicator 5515A-Clamp
Clamp 5516B
Cylindicator 5516B-Clamp
Clamp 4502
Cylindicator 4502-Clamp
Clamp 5509A
Cylindicator 5509A-Clamp
Resource
Dumps
Pin 5507A
Locator 5501AR
Locator 5503AR
Locator 5513AL
Locator 5515AL
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5510A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Clamp 5501BR
EaselCycle
Activity
Fixture
Cycle Time
12.23
Control Request Chart
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
Sense-Input
PP-ExtQrt
Sense-Input
Safe-BulkheadClampSet
1stClamps
Extend
Retract
2ndClamps
Extend
Retract
3rdClamps
Extend
Retract
4thClamps
Extend
Retract
PinSet
1stPins
Engage
Disengage
2ndPins
Engage
810
820
830

FIG. 8

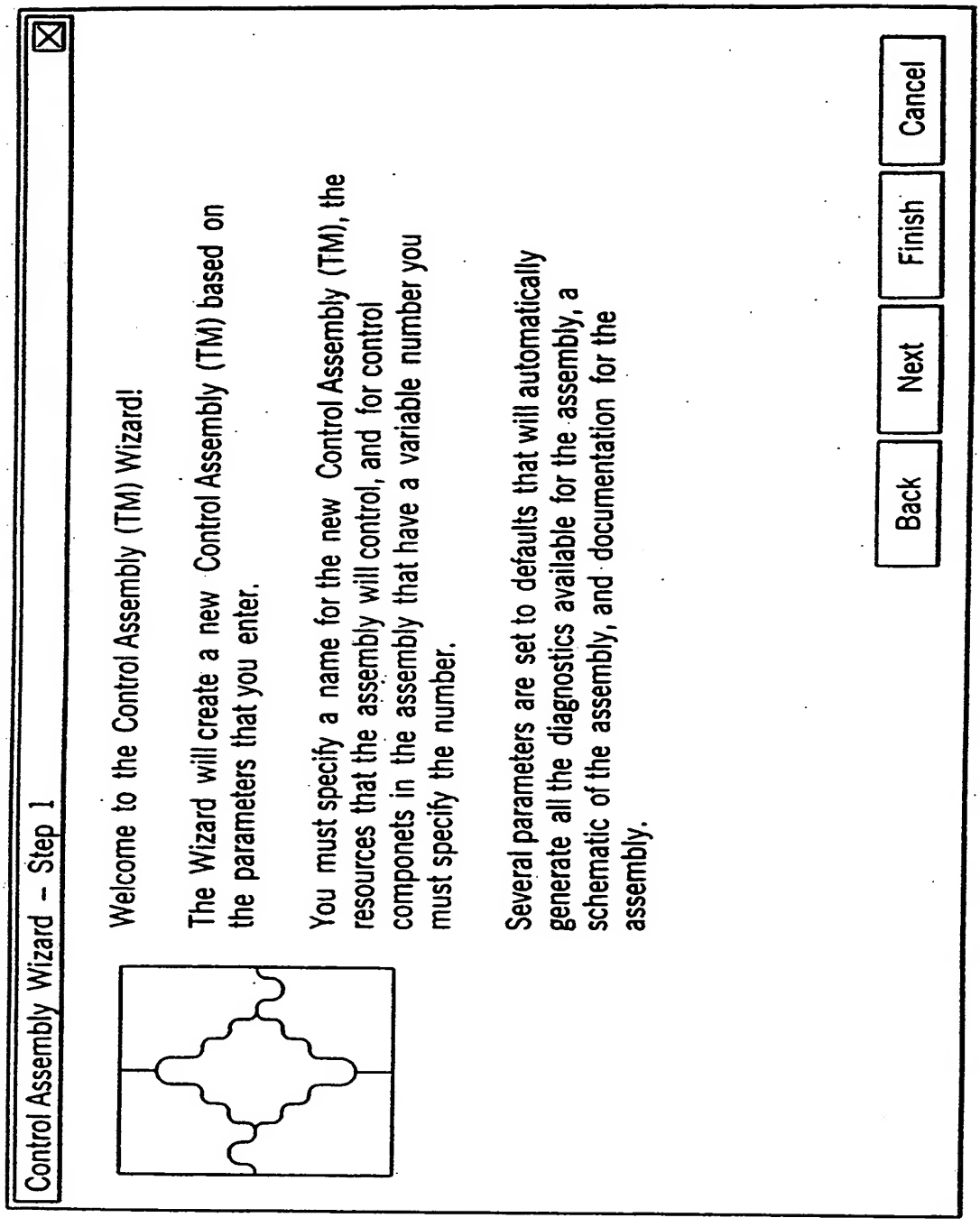

Control Assembly Wizard - Step 1
Welcome to the Control Assembly (TM) Wizard!
The Wizard will create a new Control Assembly (TM) based on the parameters that you enter.
You must specify a name for the new Control Assembly (TM), the resources that the assembly will control, and for control componets in the assembly that have a variable number you must specify the number.
Several parameters are set to defaults that will automatically generate all the diagnostics available for the assembly, a schematic of the assembly, and documentation for the assembly.
Back
Next
Finish
Cancel

FIG. 9

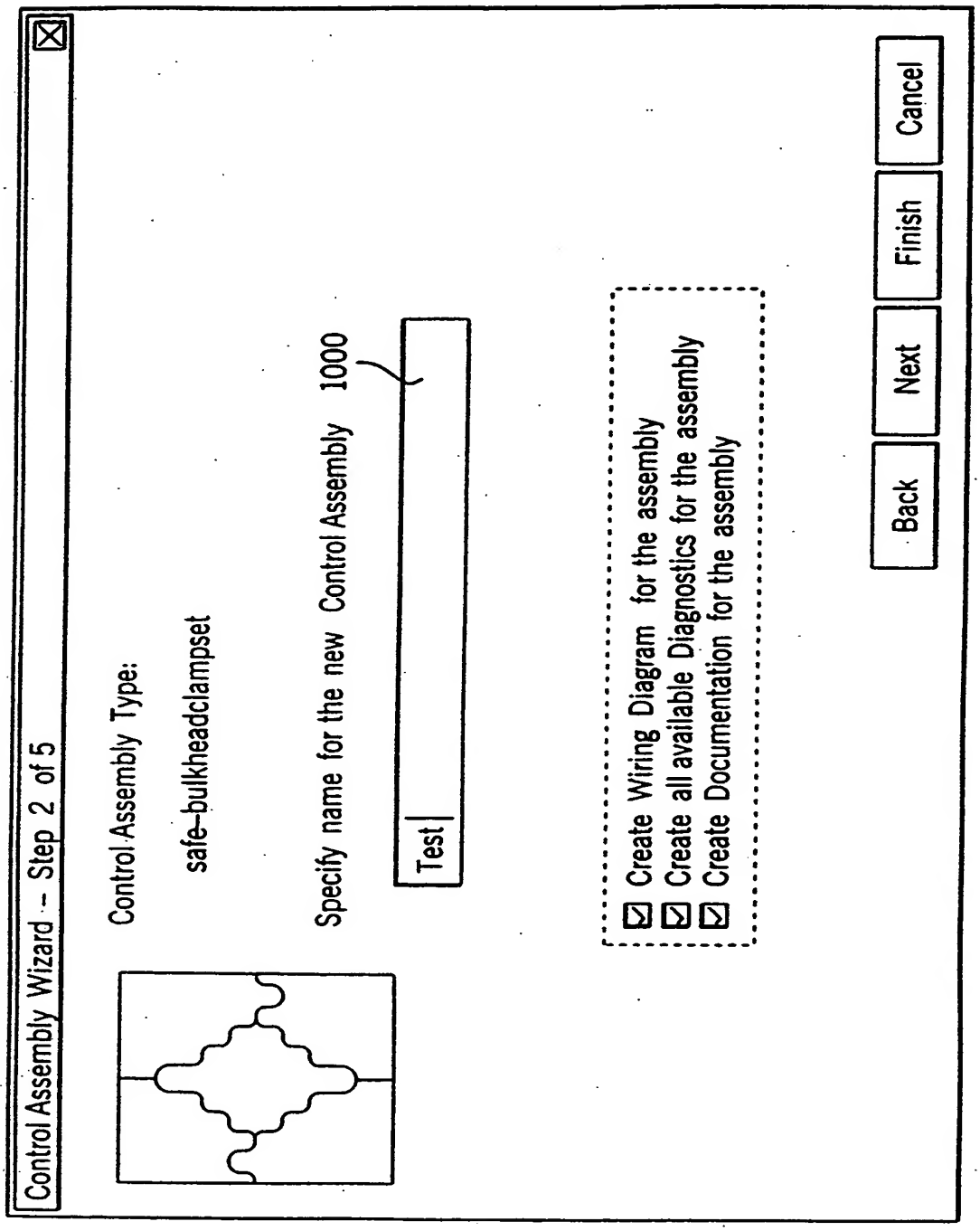

Control Assembly Wizard -- Step 2 of 5
Control Assembly Type:
safe-bulkheadclampset
Specify name for the new Control Assembly 1000
Test
Create Wiring Diagram for the assembly
Create all available Diagnostics for the assembly
Create Documentation for the assembly
Back
Next
Finish
Cancel

FIG. 10

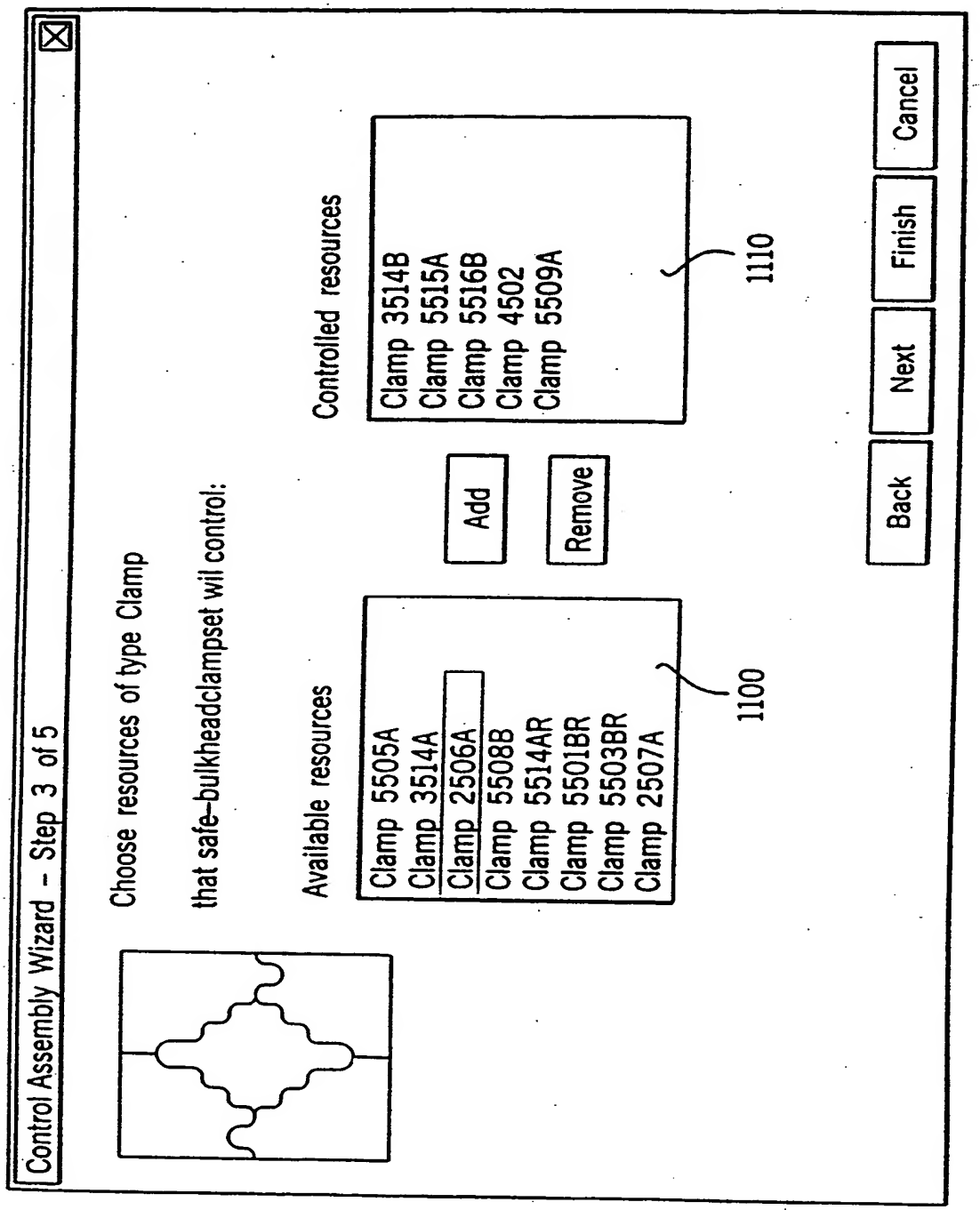

Control Assembly Wizard – Step 3 of 5
Choose resources of type Clamp
that safe–bulkheadclampset wil control:
Available resources
Clamp 5505A
Clamp 3514A
Clamp 2506A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Clamp 2507A
1100
Add
Remove
Controlled resources
Clamp 3514B
Clamp 5515A
Clamp 5516B
Clamp 4502
Clamp 5509A
1110
Back
Next
Finish
Cancel

FIG. 11

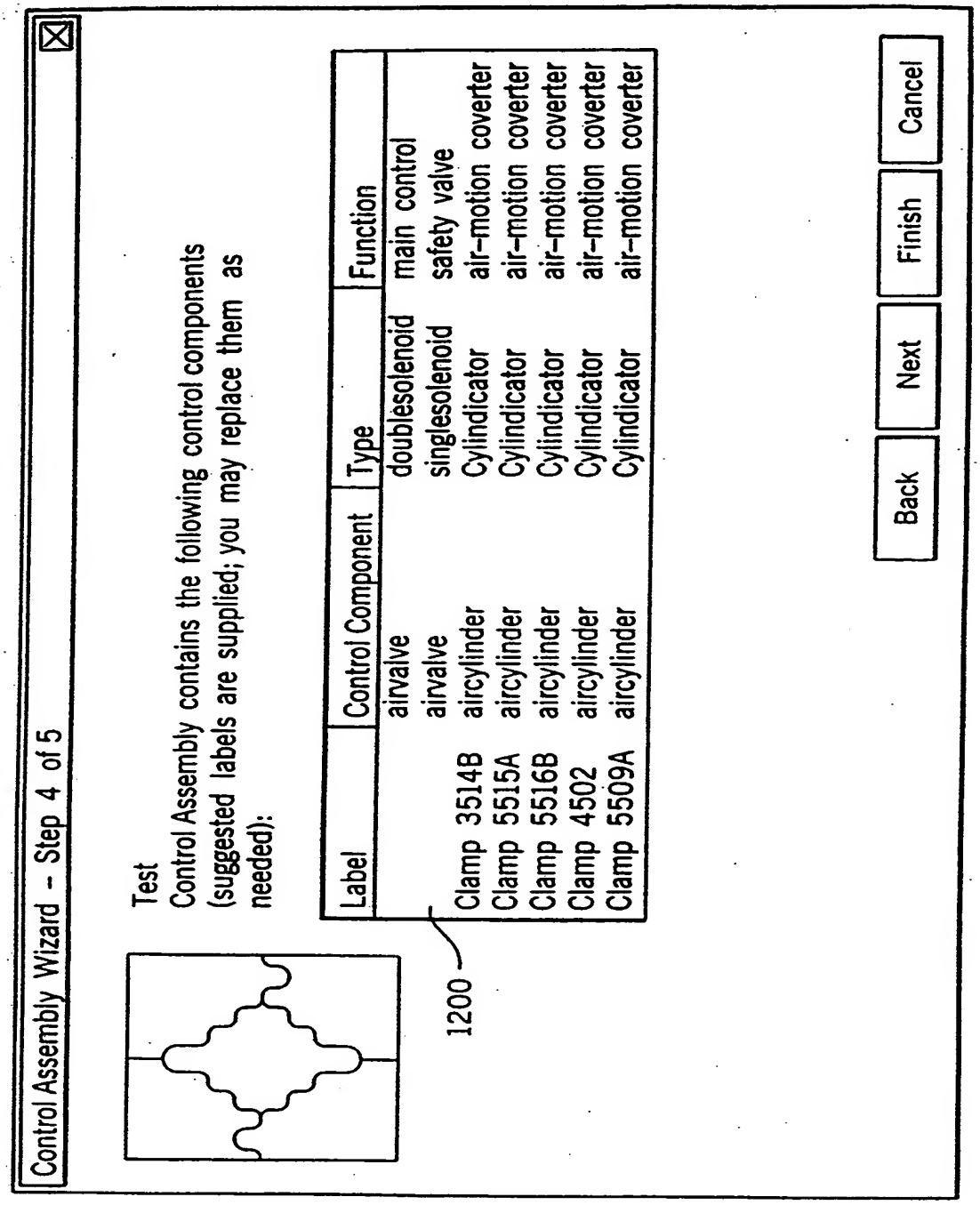
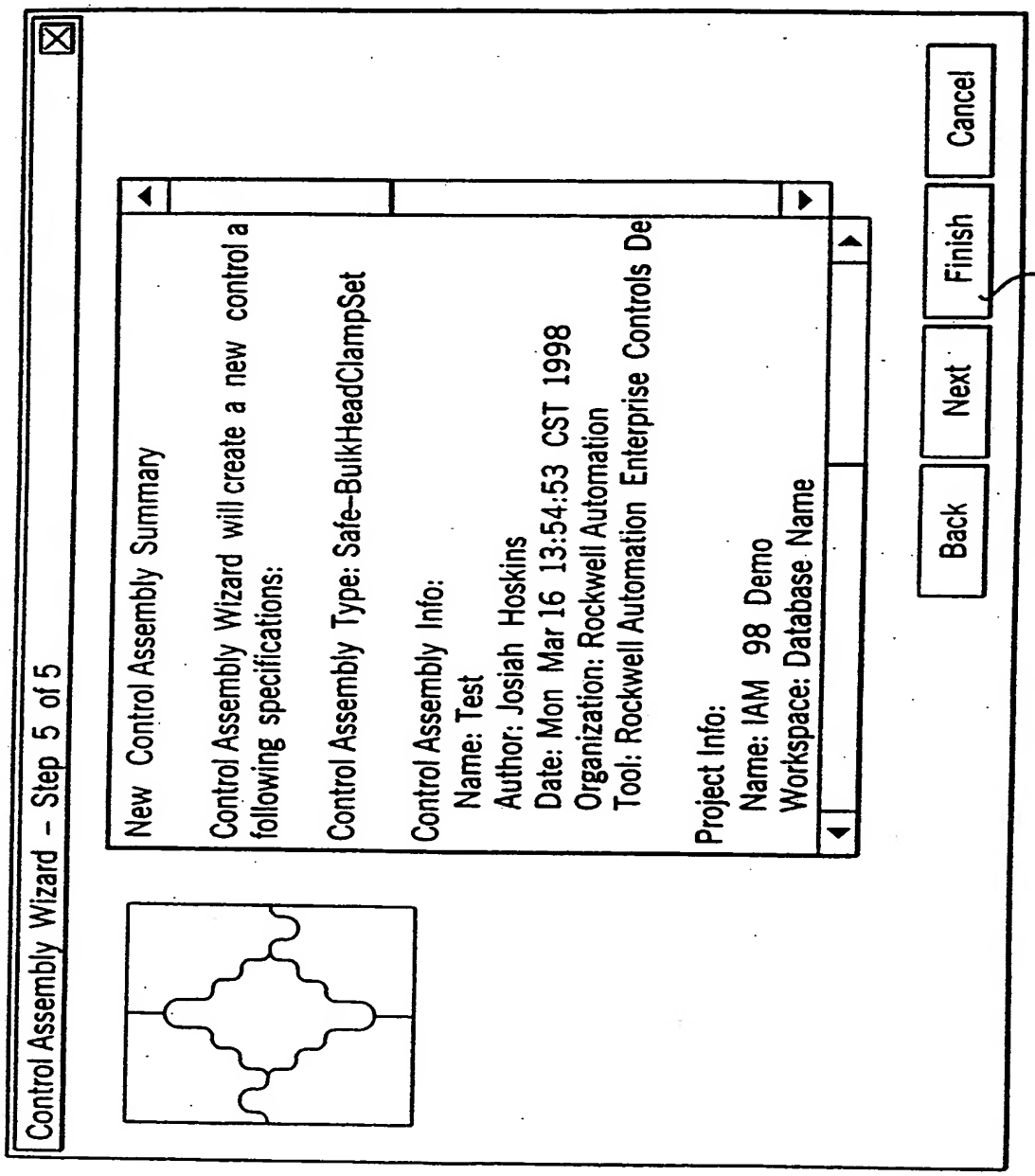

Control Assembly Wizard – Step 4 of 5
Test
Control Assembly contains the following control components (suggested labels are supplied; you may replace them as needed):
1200
Label
Control Component
Type
Function
airvalve
doublesolenoid
main control
airvalve
singlesolenoid
safety valve
Clamp 3514B
aircylinder
Cylindicator
air–motion coverter
Clamp 5515A
aircylinder
Cylindicator
air–motion coverter
Clamp 5516B
aircylinder
Cylindicator
air–motion coverter
Clamp 4502
aircylinder
Cylindicator
air–motion coverter
Clamp 5509A
aircylinder
Cylindicator
air–motion coverter
Back
Next
Finish
Cancel

FIG. 12

FIG. 13


Control Assembly Wizard - Step 5 of 5
New Control Assembly Summary
Control Assembly Wizard will create a new control a following specifications:
Control Assembly Type: Safe-BulkHeadClampSet
Control Assembly Info:
Name: Test
Author: Josiah Hoskins
Date: Mon Mar 16 13:54:53 CST 1998
Organization: Rockwell Automation
Tool: Rockwell Automation Enterprise Controls De
Project Info:
Name: IAM 98 Demo
Workspace: Database Name
Back
Next
Finish
Cancel
1300

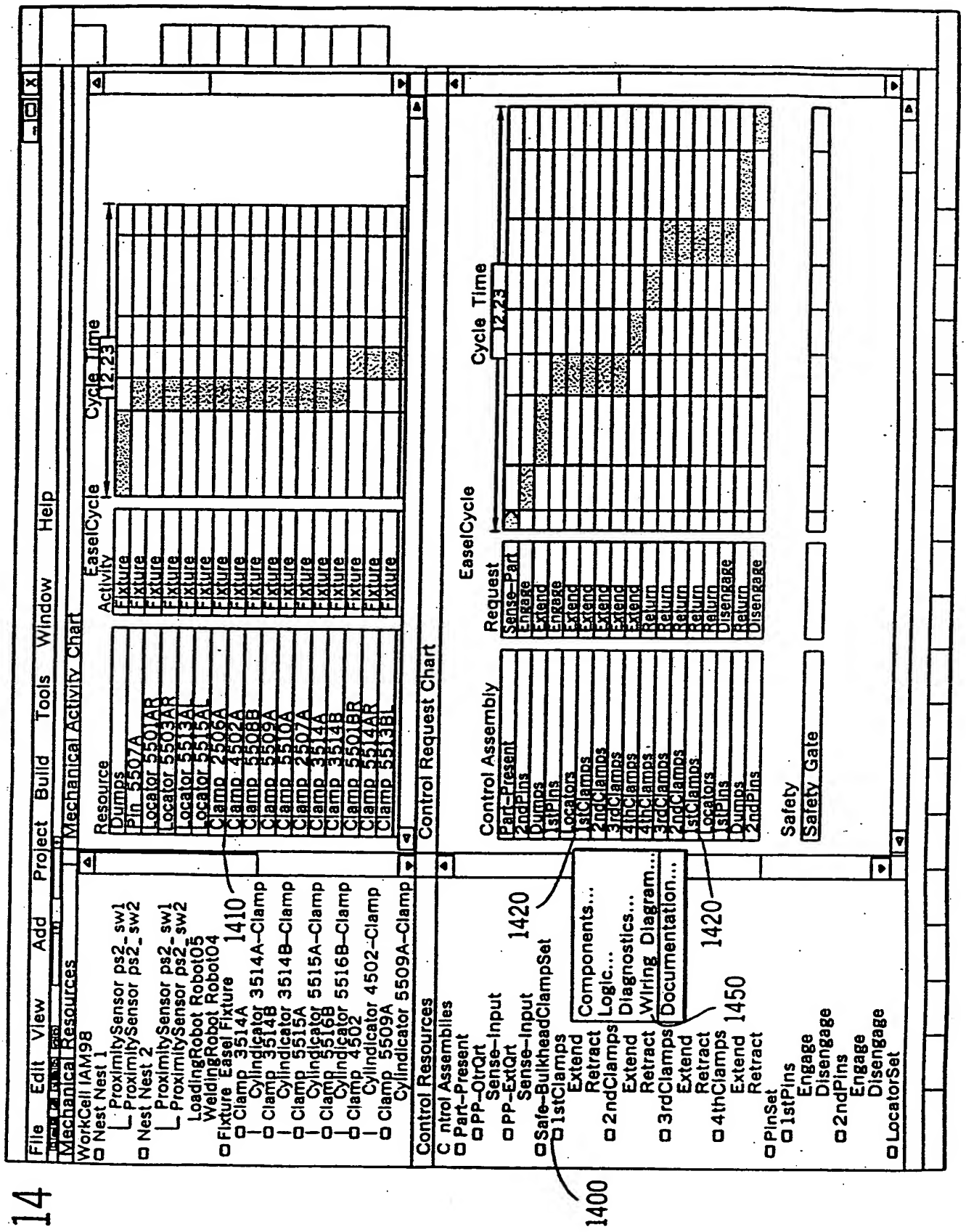

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Nest Nest 1
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
Nest Nest 2
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
LoadingRobot Robot05
WeldingRobot Robot04
Fixture Easel Fixture
Clamp 3514A
Cylindicator 3514A-Clamp
Clamp 3514B
Cylindicator 3514B-Clamp
Clamp 5515A
Cylindicator 5515A-Clamp
Clamp 5516B
Cylindicator 5516B-Clamp
Clamp 4502
Cylindicator 4502-Clamp
Clamp 5509A
Cylindicator 5509A-Clamp
1410
Mechanical Activity Chart
EaselCycle
Cycle Time
12.23
Activity
Resource
Dumps
Pin 5507A
Locator 5501AR
Locator 5503AR
Locator 5513AL
Locator 5512AL
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5510A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Clamp 5501BR
Clamp 5514AR
Clamp 5513BL
Fixture
Control Request Chart
EaselCycle
Cycle Time
12.23
Request
Control Assembly
Part-Present
2ndPins
Dumps
1stPins
Locators
1stClamps
2ndClamps
3rdClamps
4thClamps
3rdClamps
2ndClamps
1stClamps
Locators
1stPins
Dumps
2ndPins
Sense_Part
Engage
Extend
Retract
Disengage
Safety
Safety Gate
1420
1420
Control Resources
Control Assemblies
Part-Present
PP-OtrOrt
Sense-Input
PP-ExtOrt
Sense-Input
Safe-BulkheadClampSet
1stClamps
Extend
Retract
2ndClamps
Extend
Retract
3rdClamps
Extend
Retract
4thClamps
Extend
Retract
PinSet
1stPins
Engage
Disengage
2ndPins
Engage
Disengage
LocatorSet
Components...
Logic...
Diagnostics...
Wiring Diagram...
Documentation...
1450
1400

FIG. 14

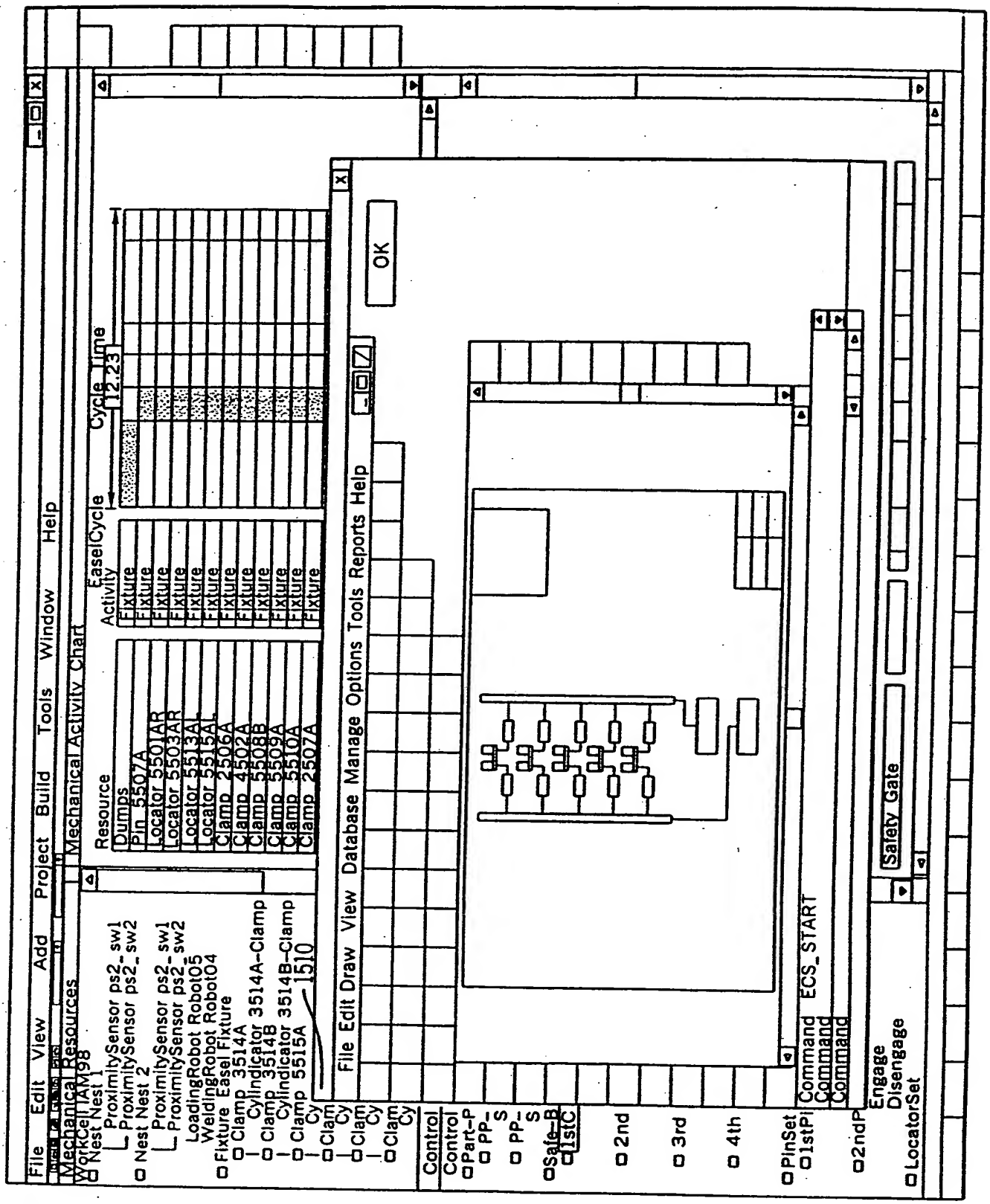

File Edit View Add Project Build Tools Window Help
Mechanical Activity Chart
WorkCell AM98
Mechanical Resources
Nest Nest 1
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
Nest Nest 2
ProximitySensor ps2_sw1
ProximitySensor ps2_sw2
LoadingRobot Robot05
WeldingRobot Robot04
Fixture Easel Fixture
Clamp 3514A
Cylindicator 3514A-Clamp
Clamp 3514B
Cylindicator 3514B-Clamp
Clamp 5515A
1510
Resource
Dumps
Pin 5507A
Locator 5501AR
Locator 5503AR
Locator 5513AL
Locator 5515AL
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5510A
Clamp 2507A
Activity
Fixture
EaselCycle
Cycle Time
12.23
File Edit Draw View Database Manage Options Tools Reports Help
OK
Control
Control
Part-P
PP-S
PP-S
Safe-B
1stC
2nd
3rd
4th
PinSet
1stPi
Command
Command
Command
ECS_START
2ndP
Engage
Disengage
LocatorSet
Safety Gate

FIG. 15

FIG. 16

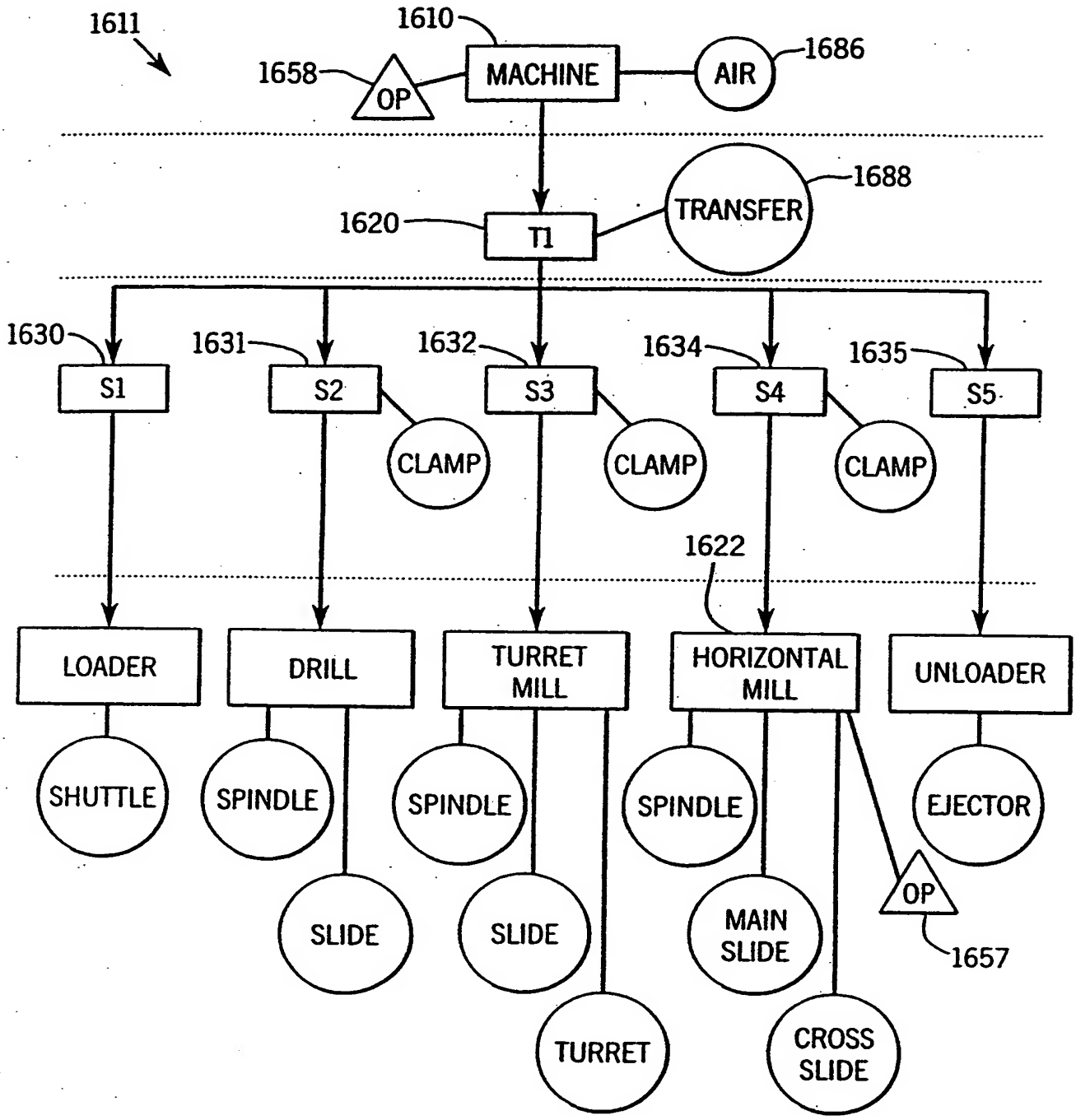

1611
1610
MACHINE
1658
OP
AIR
1686
1620
T1
TRANSFER
1688
1630
S1
1631
S2
1632
S3
1634
S4
1635
S5
CLAMP
CLAMP
CLAMP
1622
LOADER
DRILL
TURRET MILL
HORIZONTAL MILL
UNLOADER
SHUTTLE
SPINDLE
SPINDLE
SPINDLE
SPINDLE
EJECTOR
SLIDE
SLIDE
MAIN SLIDE
OP
1657
TURRET
CROSS SLIDE

FIG. 17

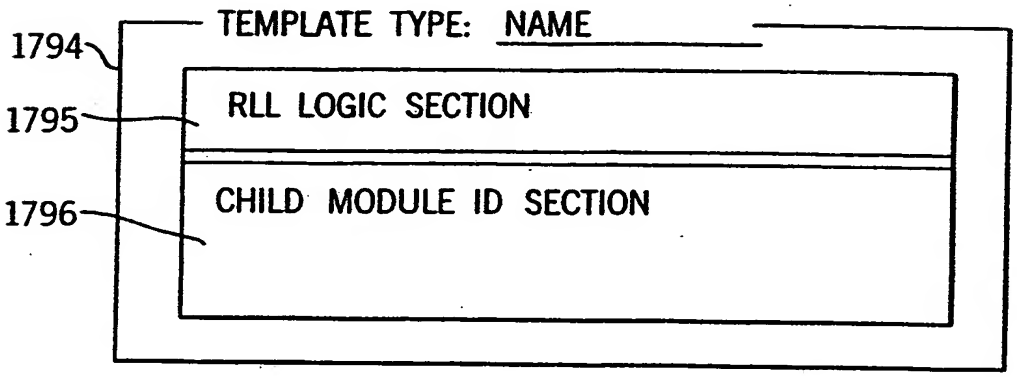

TEMPLATE TYPE: NAME
1794
RLL LOGIC SECTION
1795
CHILD MODULE ID SECTION
1796

FIG. 23

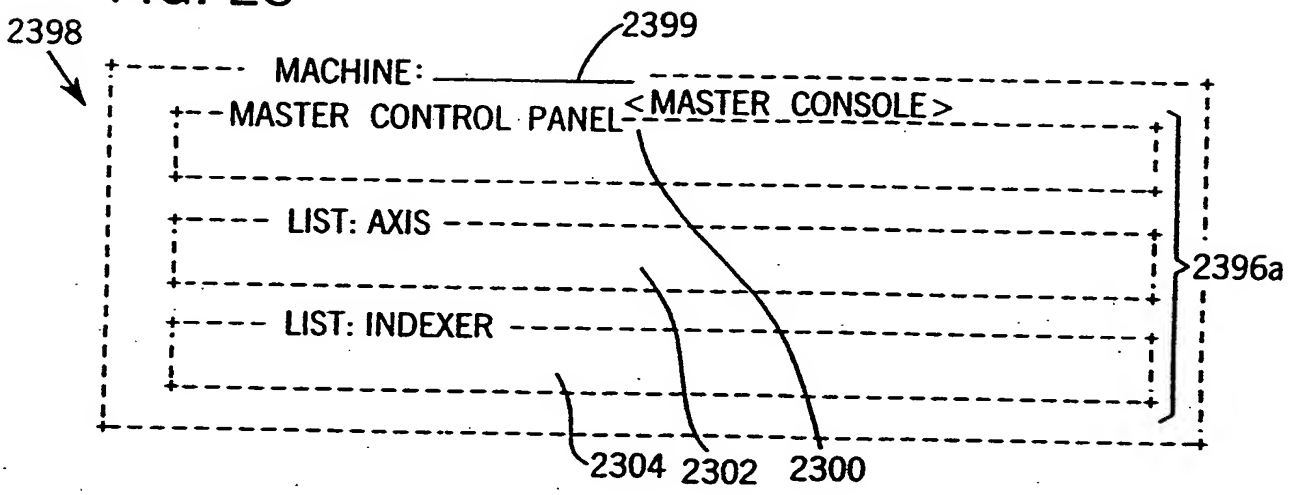

2398
2399
MACHINE:
MASTER CONTROL PANEL
<MASTER CONSOLE>
LIST: AXIS
LIST: INDEXER
2396a
2304
2302
2300

FIG. 18

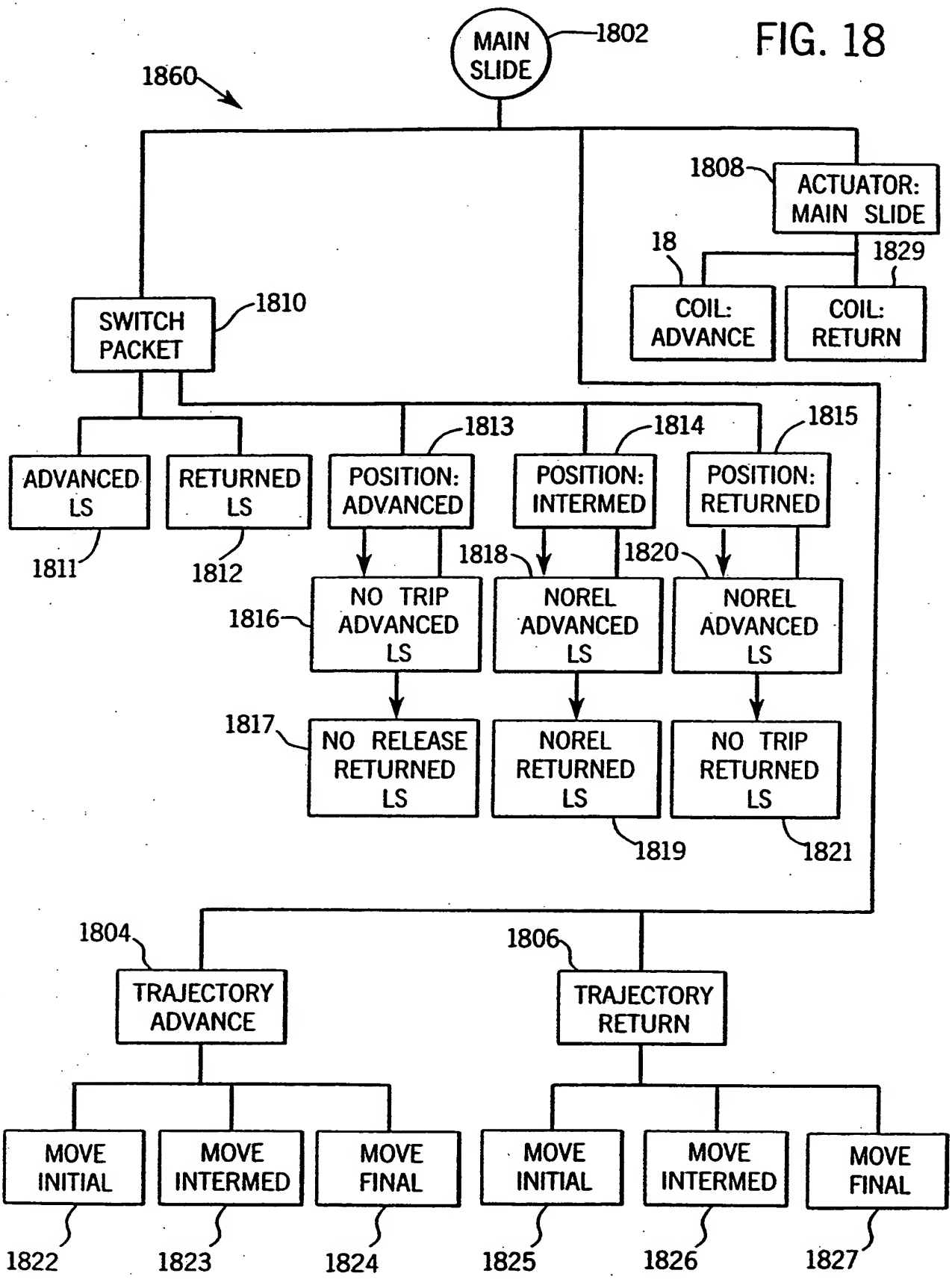

MAIN SLIDE
1802
1860
1808
ACTUATOR: MAIN SLIDE
18
1829
COIL: ADVANCE
COIL: RETURN
SWITCH PACKET
1810
ADVANCED LS
RETURNED LS
POSITION: ADVANCED
POSITION: INTERMED
POSITION: RETURNED
1813
1814
1815
1811
1812
1818
1820
NO TRIP ADVANCED LS
NOREL ADVANCED LS
NOREL ADVANCED LS
1816
1817
NO RELEASE RETURNED LS
NOREL RETURNED LS
NO TRIP RETURNED LS
1819
1821
1804
1806
TRAJECTORY ADVANCE
TRAJECTORY RETURN
MOVE INITIAL
MOVE INTERMED
MOVE FINAL
MOVE INITIAL
MOVE INTERMED
MOVE FINAL
1822
1823
1824
1825
1826
1827

FIG. 19

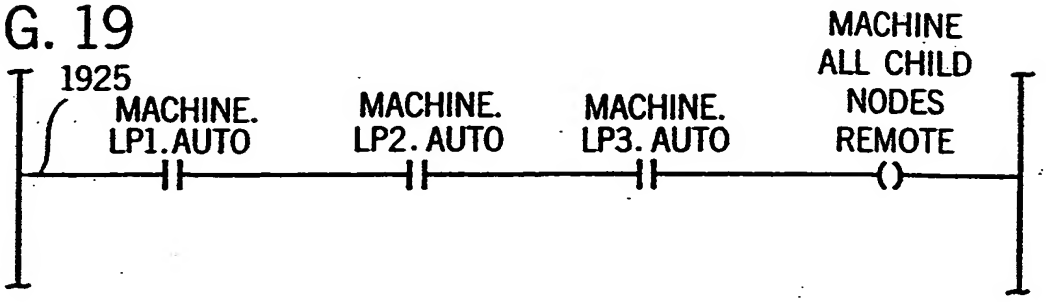


FIG. 20

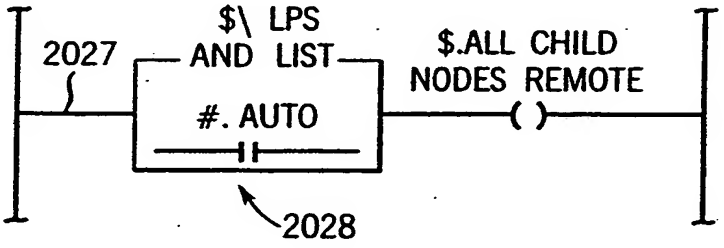


FIG. 21

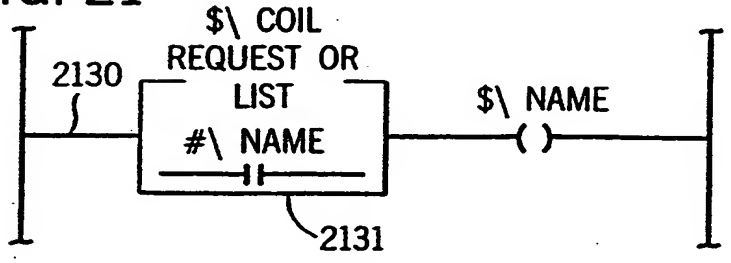
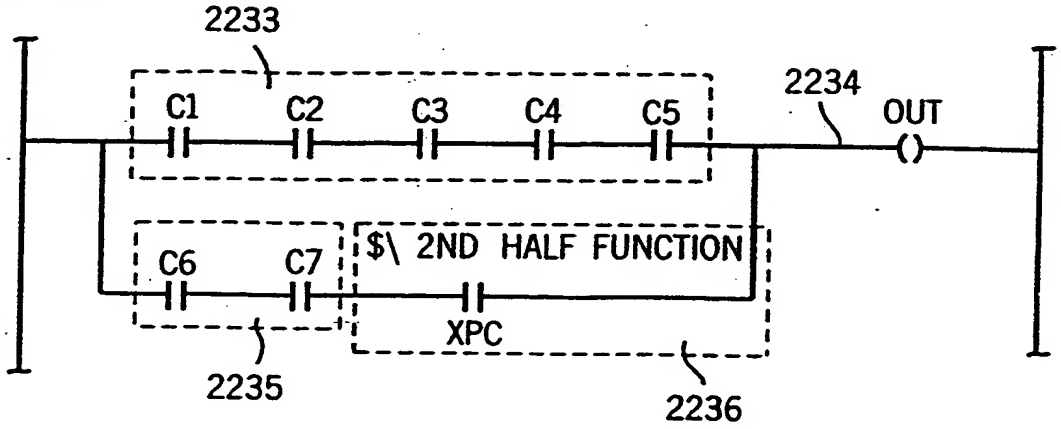


FIG. 22



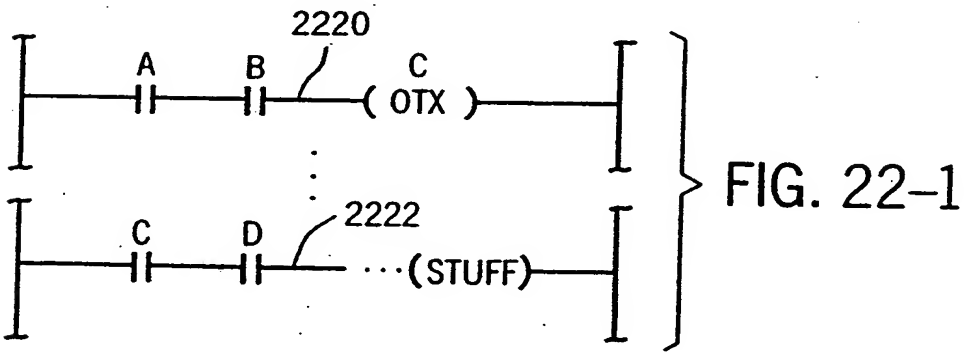


FIG. 22–1

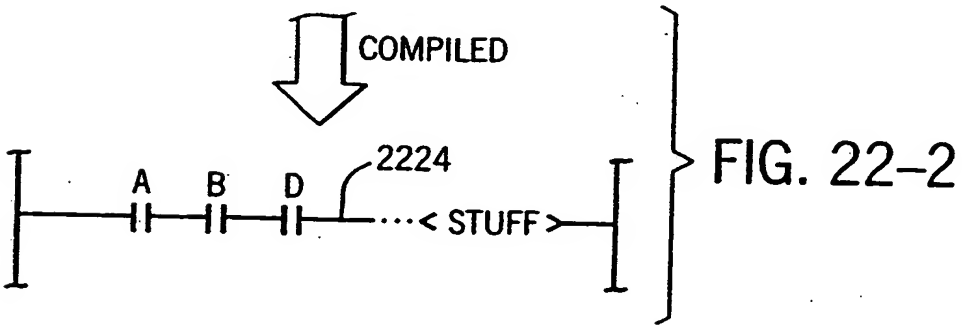


FIG. 22–2

FIG. 24

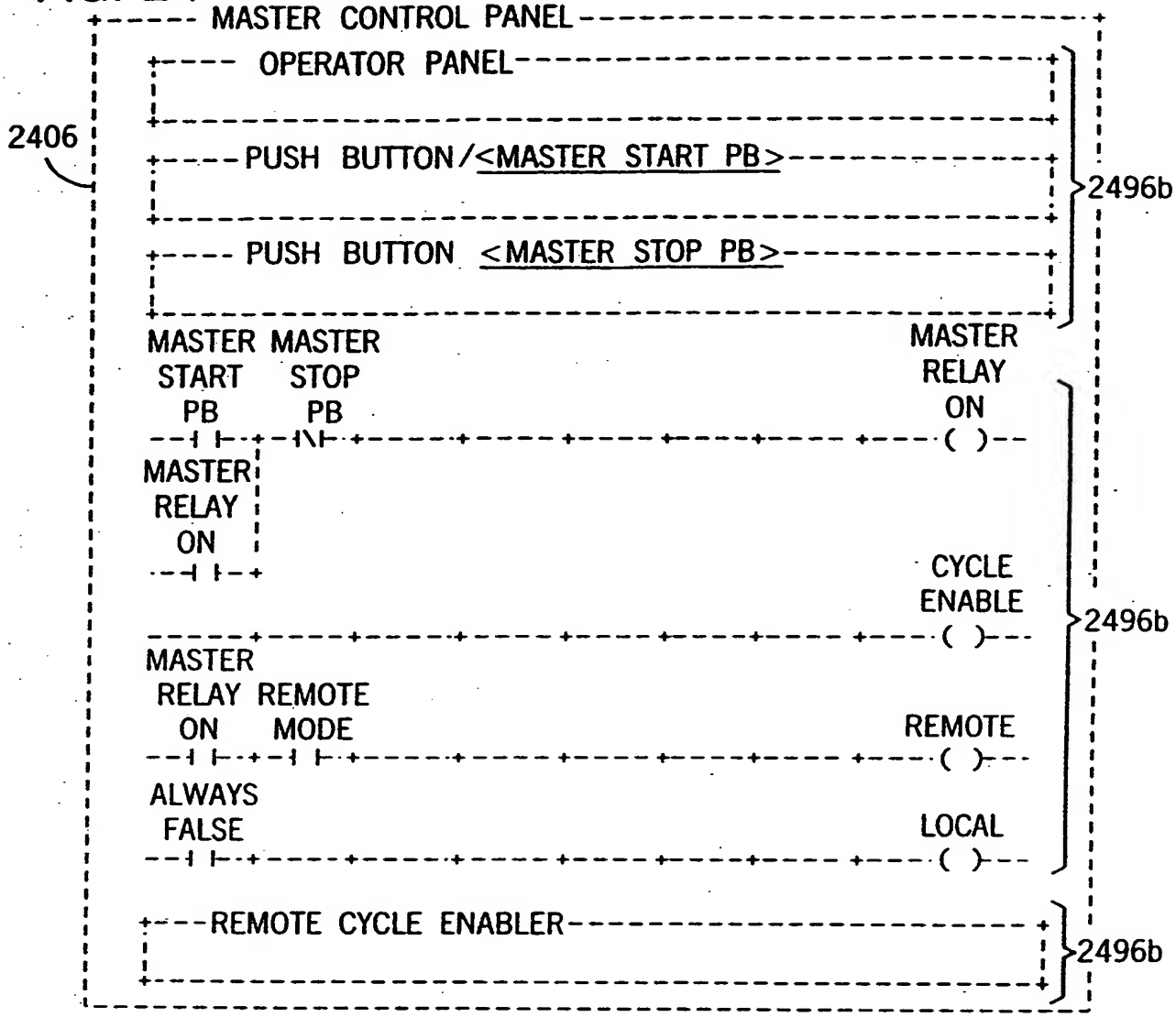

MASTER CONTROL PANEL
OPERATOR PANEL
2406
PUSH BUTTON/<MASTER START PB>
PUSH BUTTON <MASTER STOP PB>
2496b
MASTER START PB
MASTER STOP PB
MASTER RELAY ON
MASTER RELAY ON
CYCLE ENABLE
MASTER RELAY ON
REMOTE MODE
REMOTE
ALWAYS FALSE
LOCAL
2496b
REMOTE CYCLE ENABLER
2496b

FIG. 25

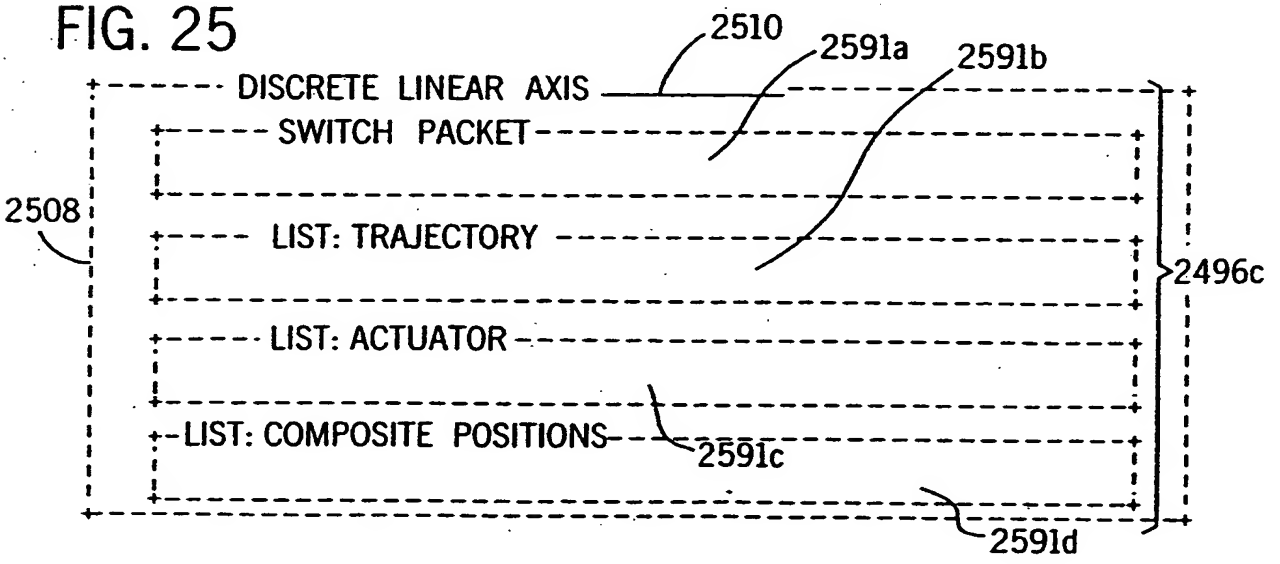

2510
2591a
2591b
DISCRETE LINEAR AXIS
SWITCH PACKET
2508
LIST: TRAJECTORY
2496c
LIST: ACTUATOR
LIST: COMPOSITE POSITIONS
2591c
2591d

FIG. 26

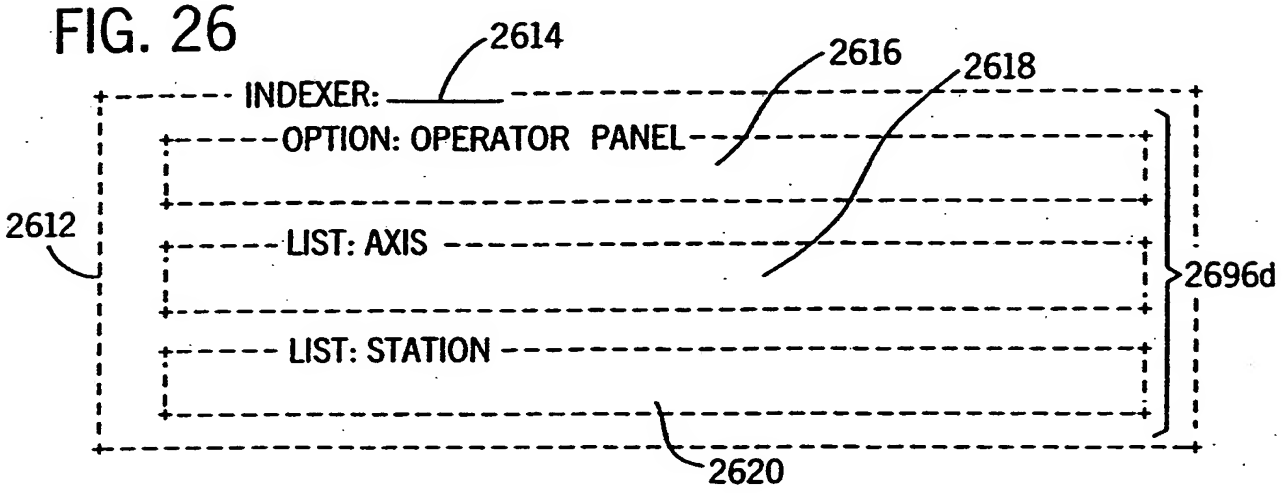


FIG. 27

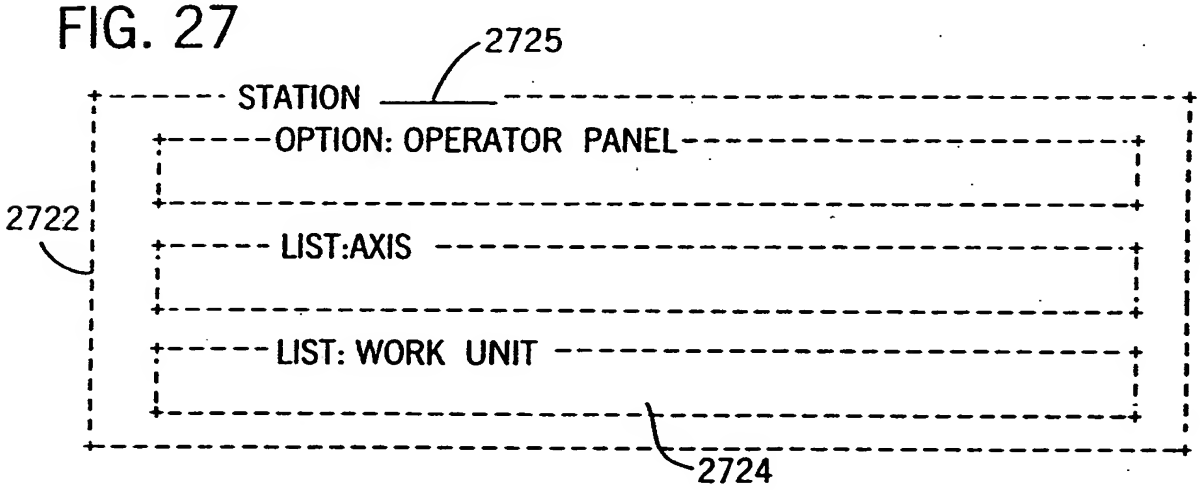


FIG. 28

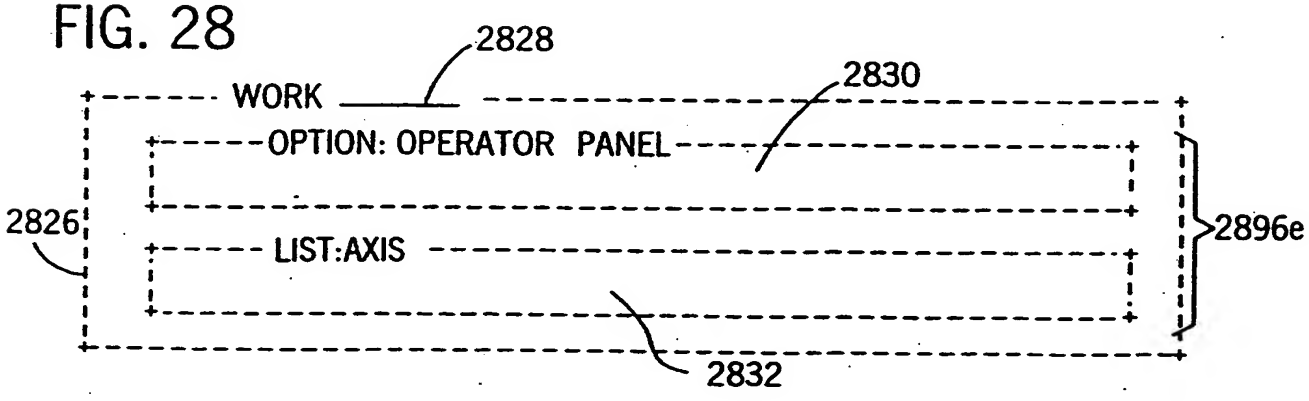
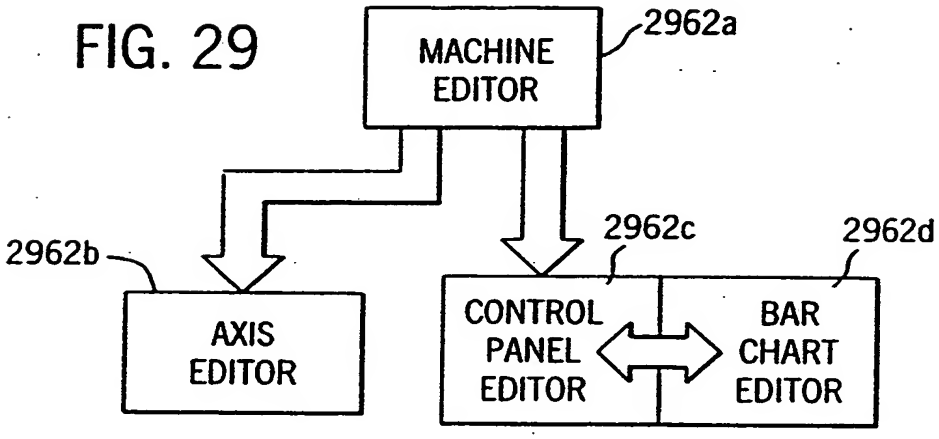


FIG. 29


MACHINE EDITOR
2962a
2962b
AXIS EDITOR
2962c
CONTROL PANEL EDITOR
2962d
BAR CHART EDITOR

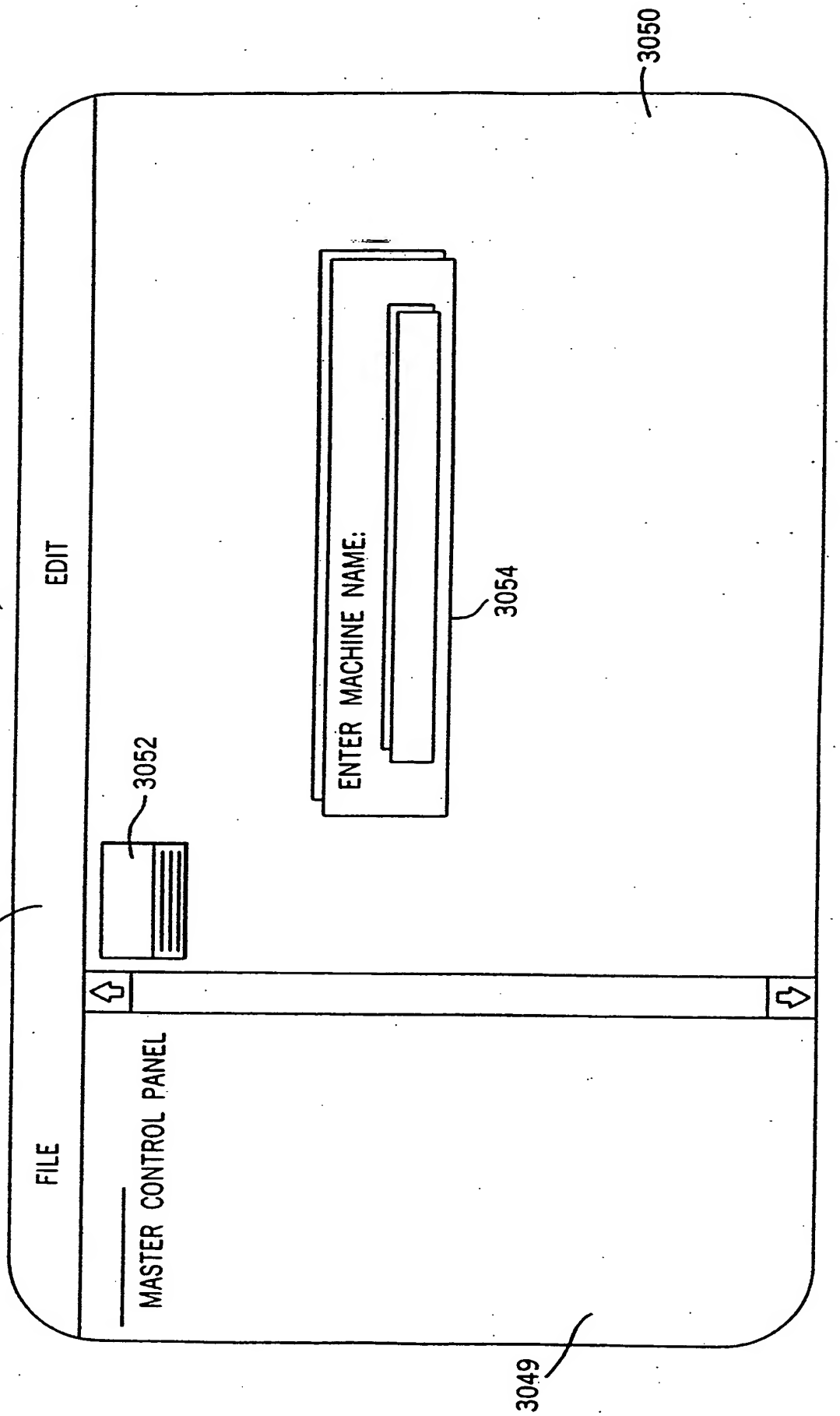

3050
3042
EDIT
ENTER MACHINE NAME:
3054
3052
3044
FILE
MASTER CONTROL PANEL
3049

FIG. 30

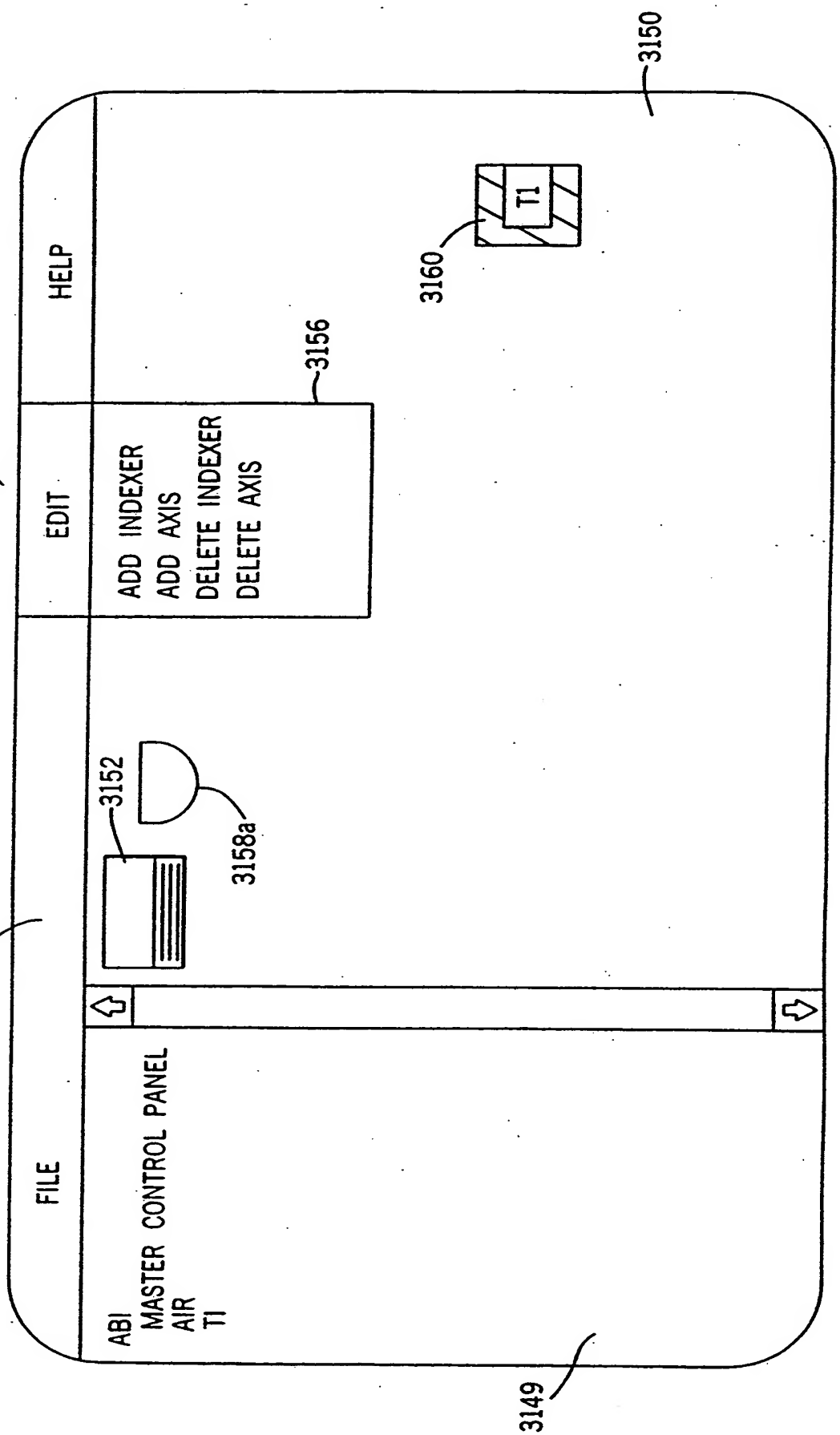

3150
HELP
EDIT
FILE
ADD INDEXER
ADD AXIS
DELETE INDEXER
DELETE AXIS
3142
3156
3160
T1
3152
3158a
3144
ABI
MASTER CONTROL PANEL
AIR
TI
3149

FIG. 31

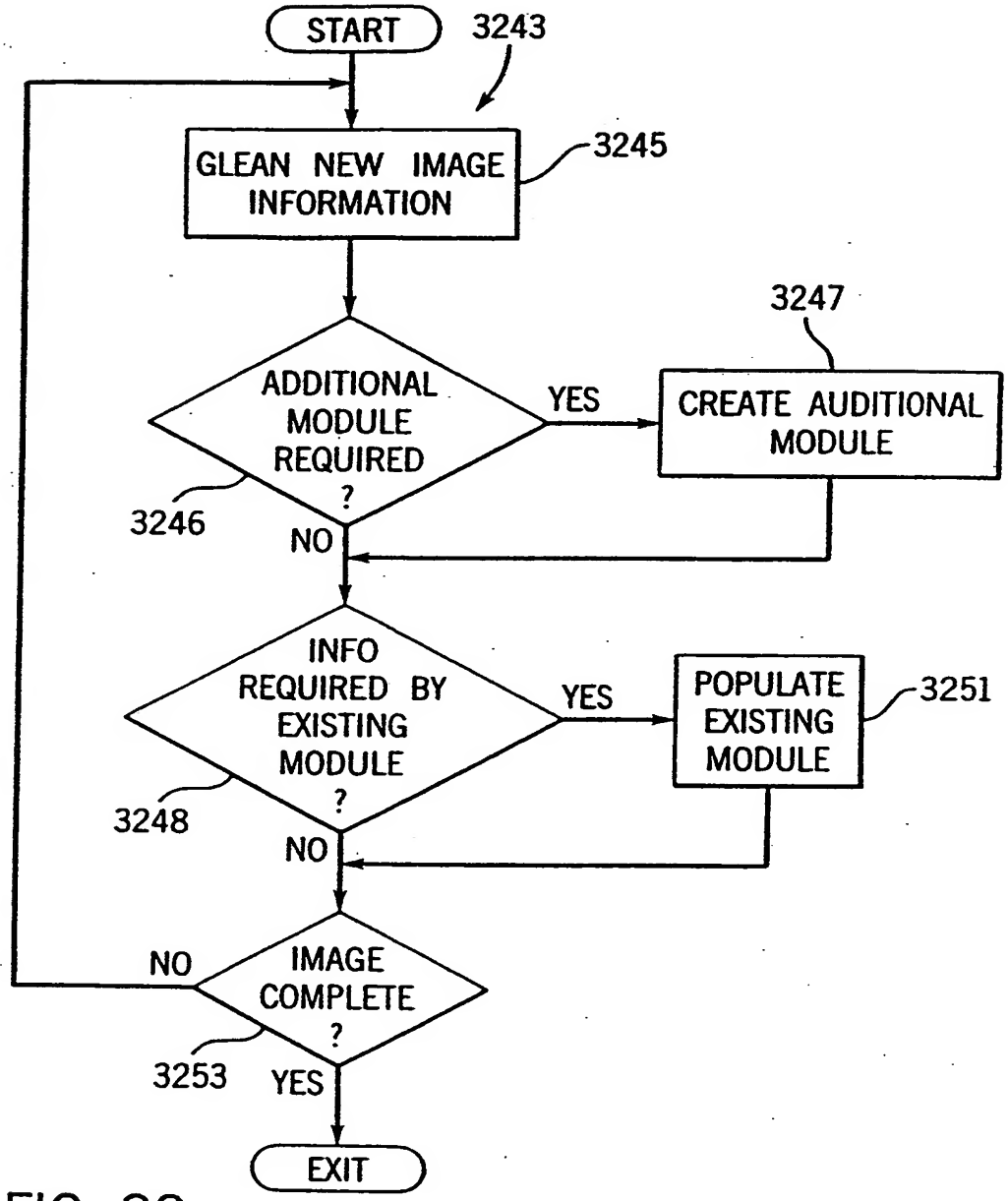

START
3243
GLEAN NEW IMAGE INFORMATION
3245
3247
ADDITIONAL MODULE REQUIRED ?
YES
CREATE AUDITIONAL MODULE
3246
NO
INFO REQUIRED BY EXISTING MODULE ?
YES
POPULATE EXISTING MODULE
3251
3248
NO
IMAGE COMPLETE ?
NO
3253
YES
EXIT

FIG. 32

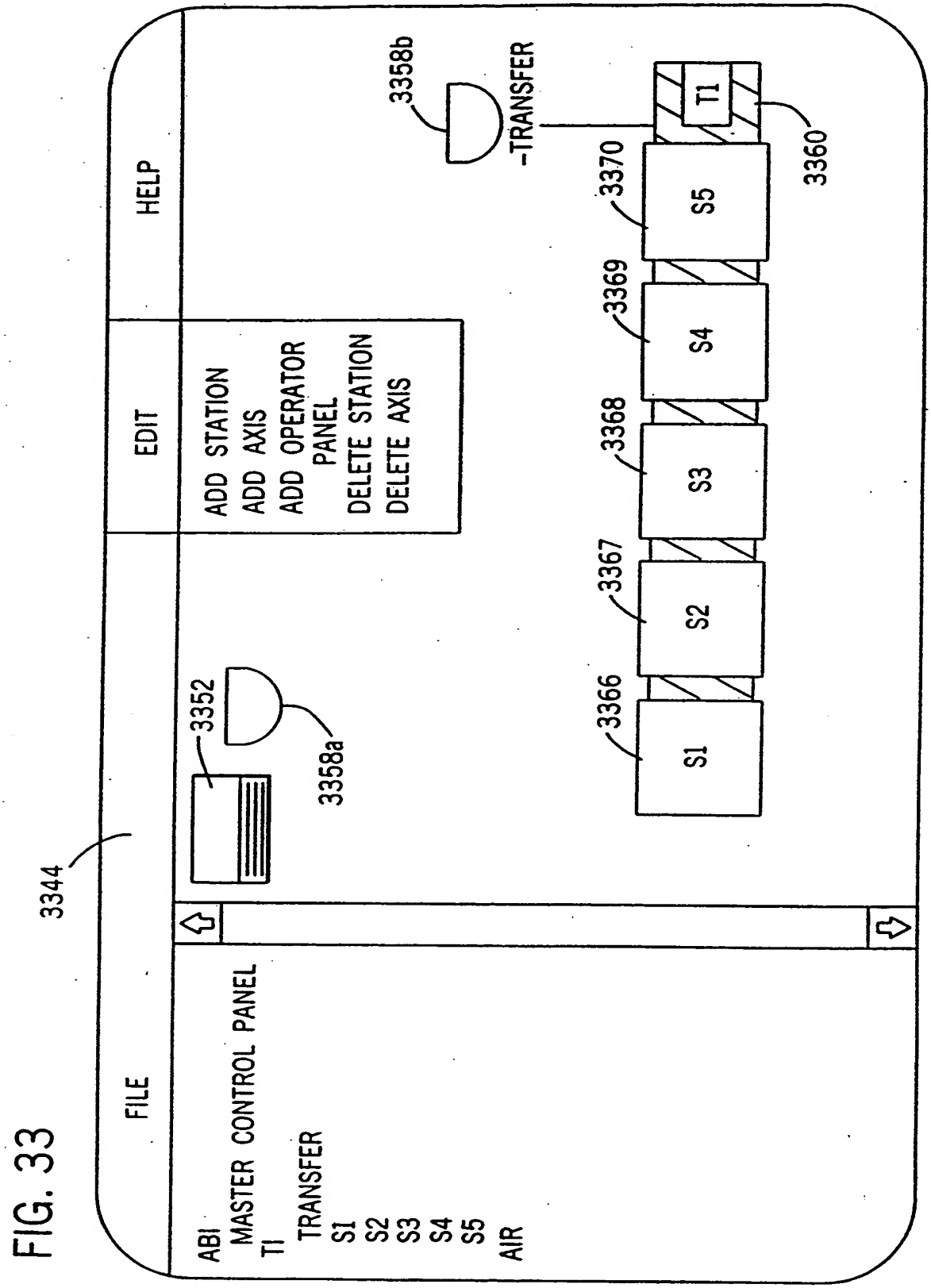

FILE
EDIT
HELP
ADD STATION
ADD AXIS
ADD OPERATOR PANEL
DELETE STATION
DELETE AXIS
ABI
MASTER CONTROL PANEL
T1
TRANSFER
S1
S2
S3
S4
S5
AIR
3344
3352
3358a
3358b
-TRANSFER
T1
S5
S4
S3
S2
S1
3366
3367
3368
3369
3370
3360

FIG. 33

FIG. 34

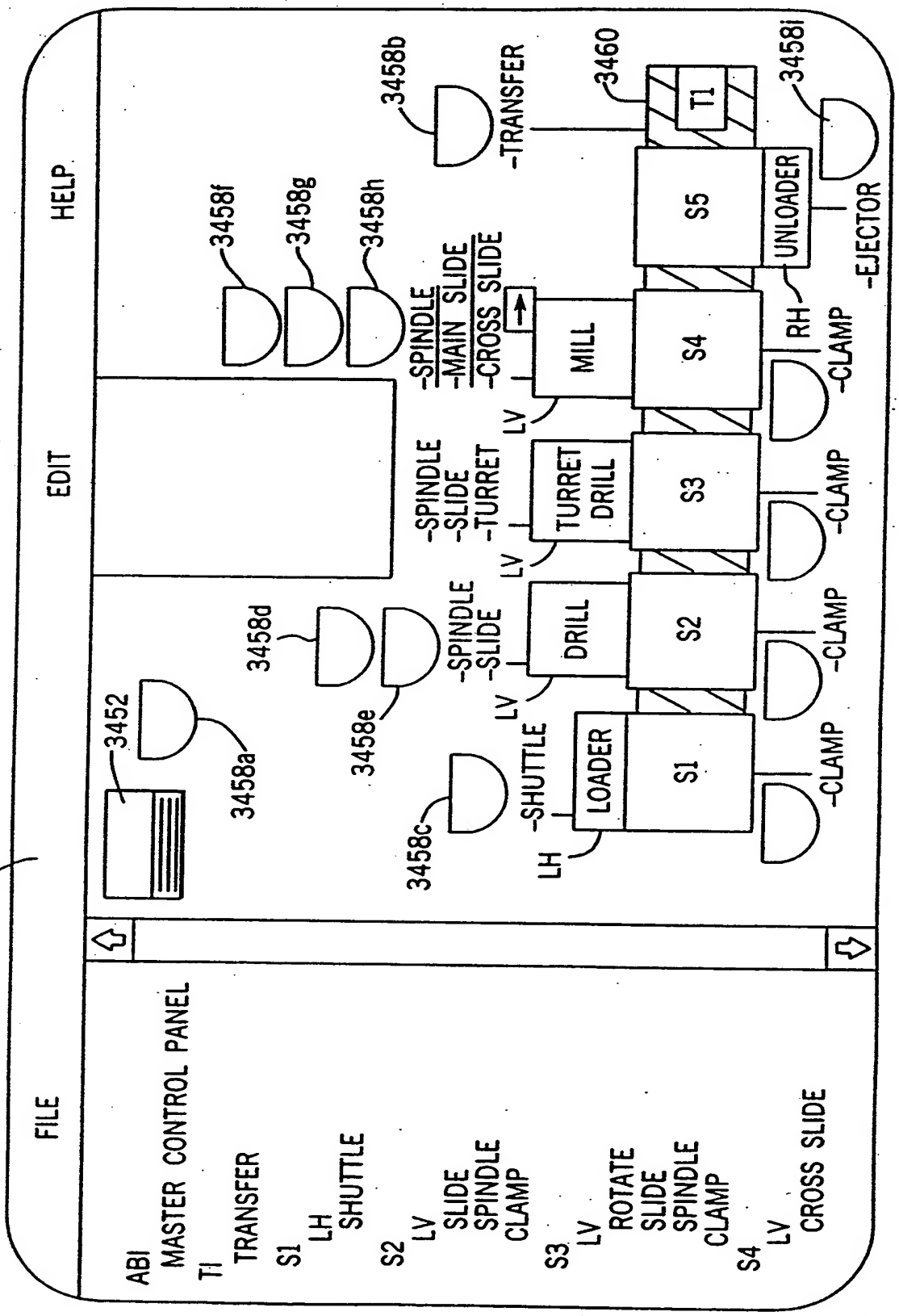
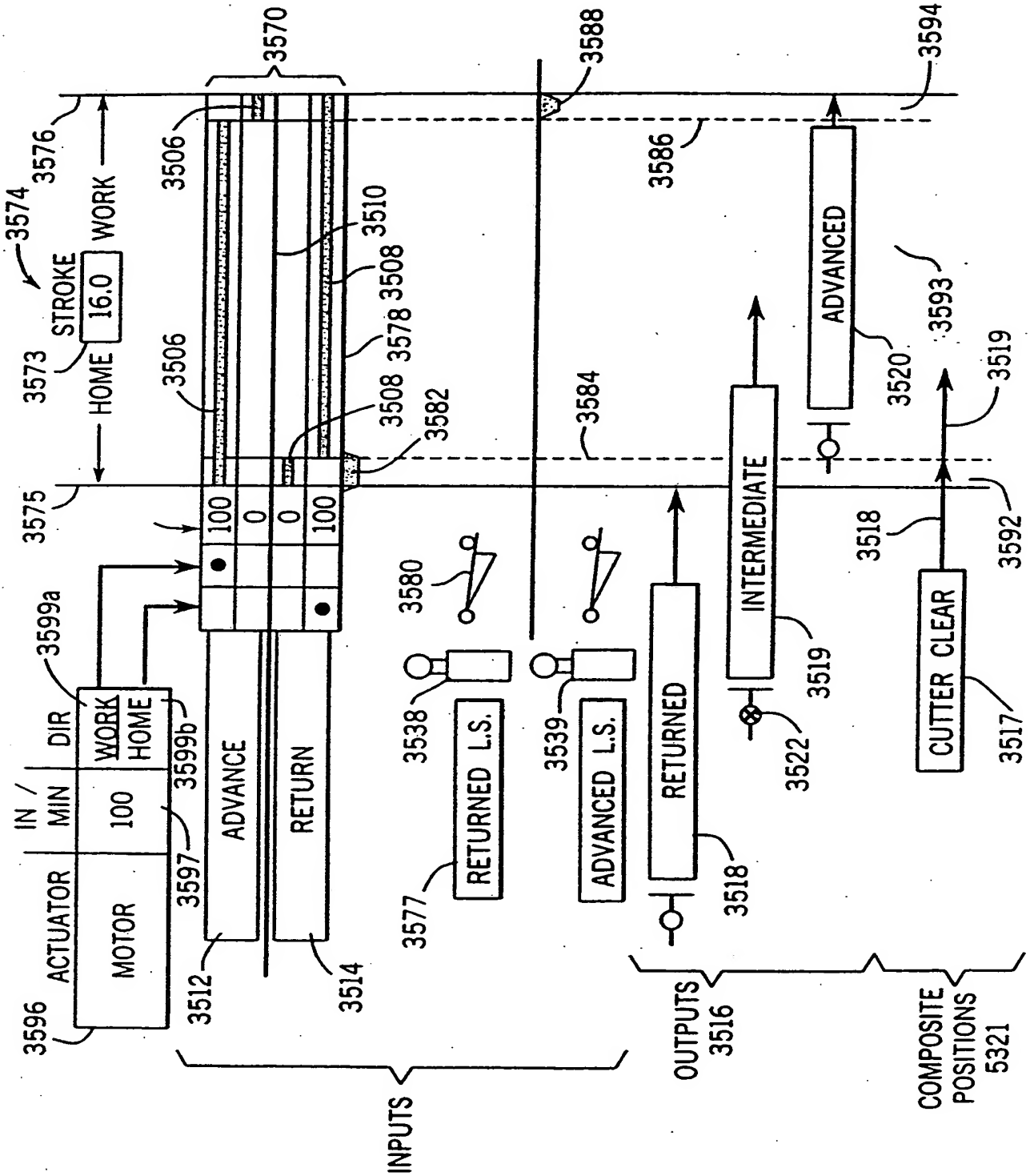

3444
FILE
EDIT
HELP
ABI
MASTER CONTROL PANEL
T1
TRANSFER
S1
LH
SHUTTLE
S2
LV
SLIDE
SPINDLE
CLAMP
S3
LV
ROTATE
SLIDE
SPINDLE
CLAMP
S4
LV
CROSS SLIDE
3452
3458a
3458c
3458d
3458e
3458f
3458g
3458h
3458b
3460
3458i
LOADER
S1
DRILL
S2
TURRET DRILL
S3
MILL
S4
S5
UNLOADER
T1
-SHUTTLE
-SPINDLE
-SLIDE
-SPINDLE
-SLIDE
-TURRET
-SPINDLE
-MAIN SLIDE
-CROSS SLIDE
-TRANSFER
-EJECTOR
-CLAMP
-CLAMP
-CLAMP
-CLAMP
RH
LH
LV
LV
LV

FIG. 35


3570
3588
3594
3576
3574
3506
3586
WORK
3510
3508
STROKE
16.0
3578
3573
HOME
3506
3593
ADVANCED
3520
3519
3508
3582
3584
3575
100
0
0
100
3592
3518
3580
3599a
DIR
WORK
HOME
3599b
3538
3539
INTERMEDIATE
3519
IN / MIN
100
ACTUATOR
MOTOR
3597
ADVANCE
RETURN
RETURNED L.S.
ADVANCED L.S.
RETURNED
3522
CUTTER CLEAR
3517
3577
3518
3512
3514
3596
OUTPUTS
3516
COMPOSITE POSITIONS
5321
INPUTS

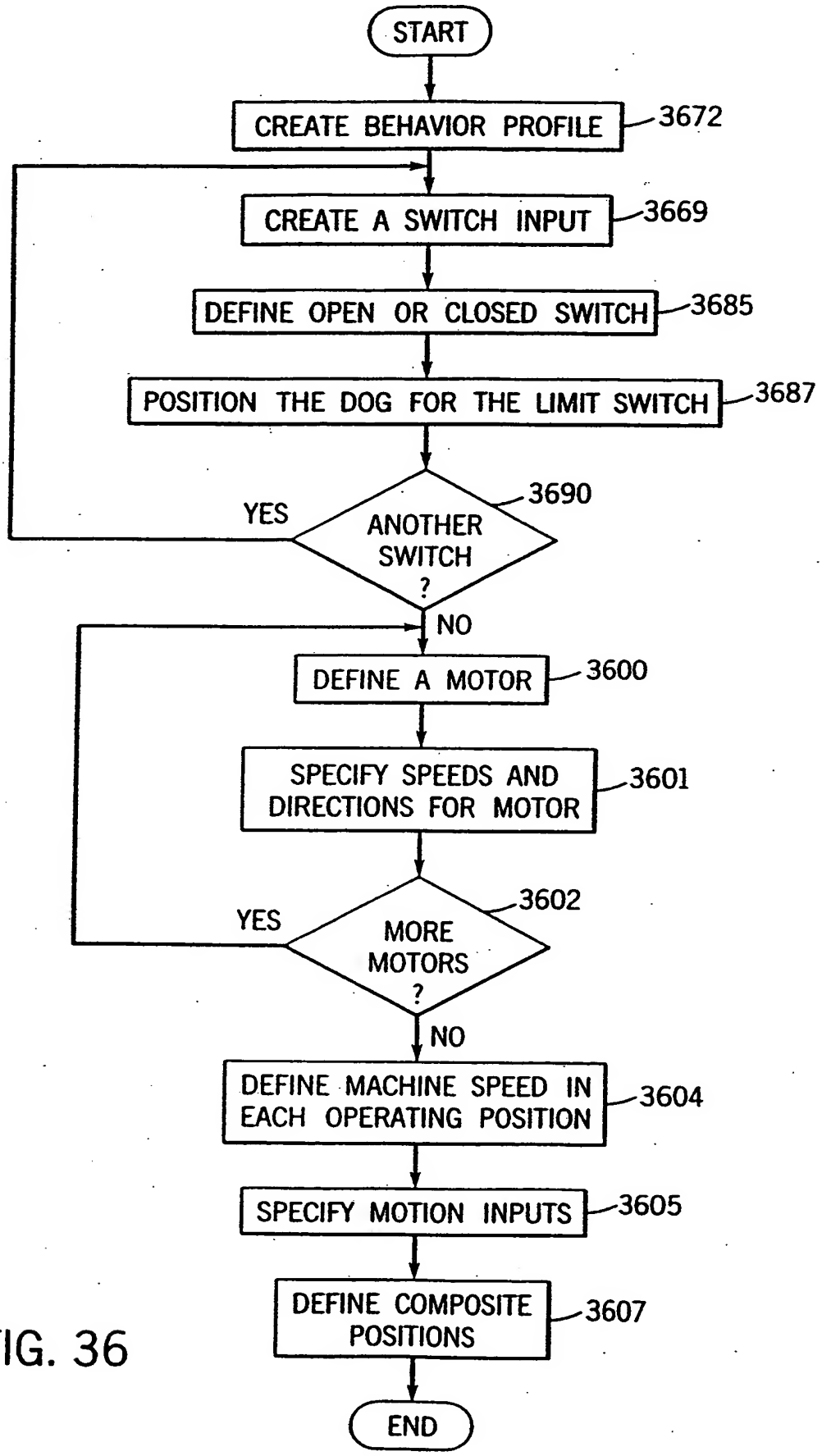

START
CREATE BEHAVIOR PROFILE
3672
CREATE A SWITCH INPUT
3669
DEFINE OPEN OR CLOSED SWITCH
3685
POSITION THE DOG FOR THE LIMIT SWITCH
3687
ANOTHER SWITCH ?
3690
YES
NO
DEFINE A MOTOR
3600
SPECIFY SPEEDS AND DIRECTIONS FOR MOTOR
3601
MORE MOTORS ?
3602
YES
NO
DEFINE MACHINE SPEED IN EACH OPERATING POSITION
3604
SPECIFY MOTION INPUTS
3605
DEFINE COMPOSITE POSITIONS
3607
END

FIG. 36

FIG. 37

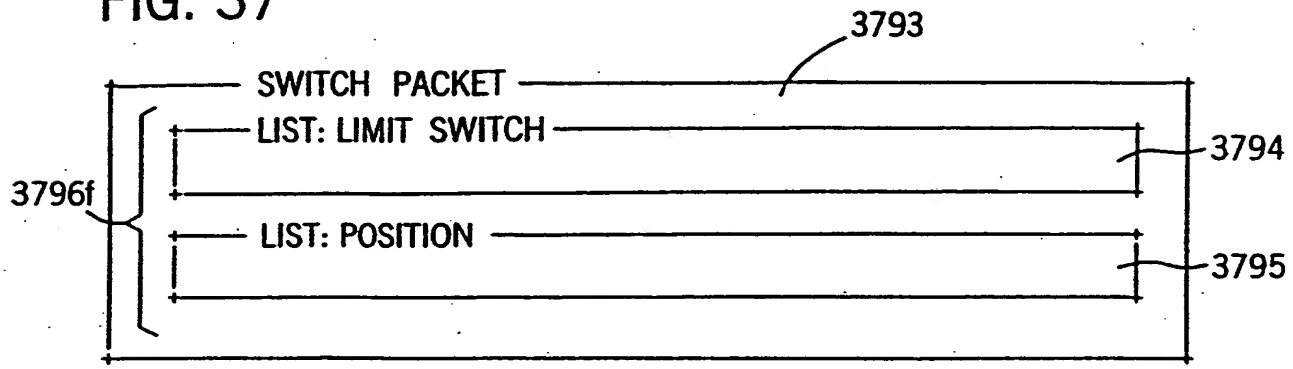

3793
SWITCH PACKET
LIST: LIMIT SWITCH
3794
3796f
LIST: POSITION
3795

FIG. 38

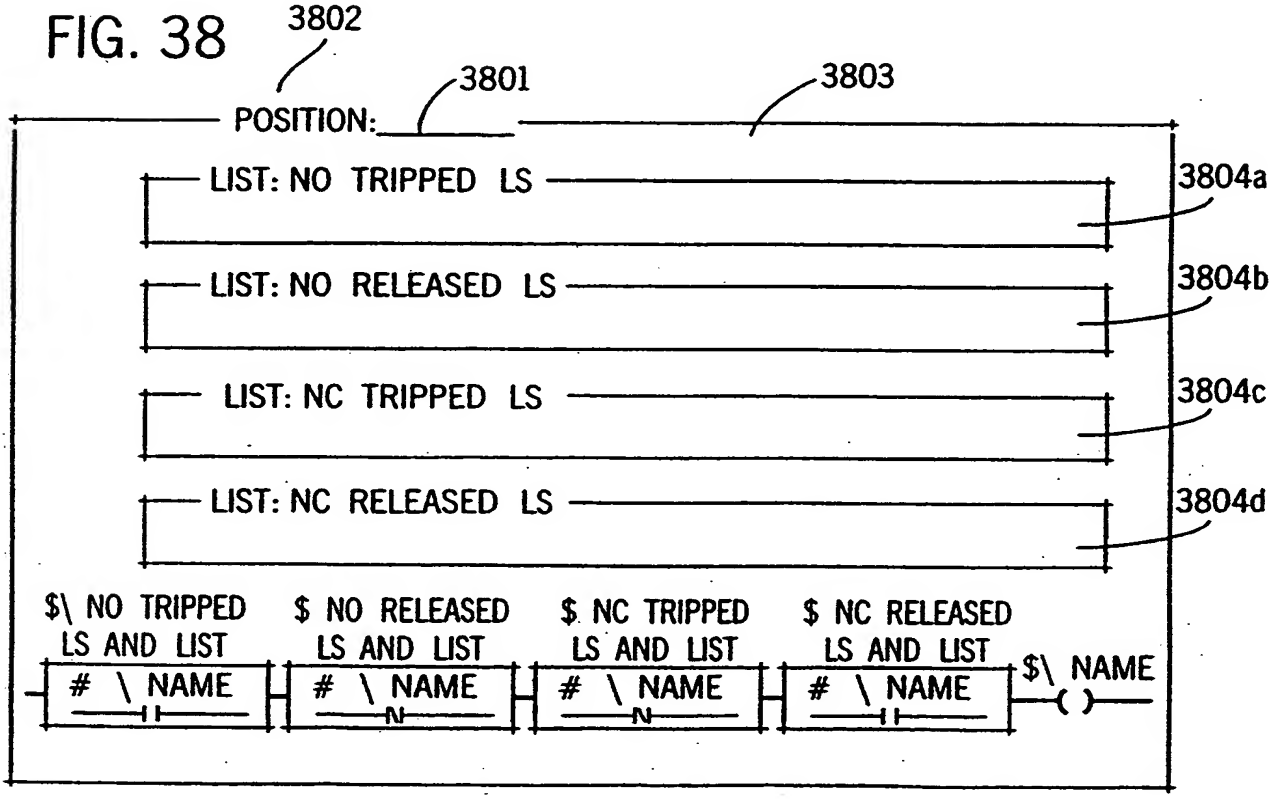

3802
3801
3803
POSITION:
LIST: NO TRIPPED LS
3804a
LIST: NO RELEASED LS
3804b
LIST: NC TRIPPED LS
3804c
LIST: NC RELEASED LS
3804d
$\ NO TRIPPED LS AND LIST
$ NO RELEASED LS AND LIST
$ NC TRIPPED LS AND LIST
$ NC RELEASED LS AND LIST
# \ NAME
# \ NAME
N
\ NAME
N
\ NAME
$\ NAME

FIG. 39

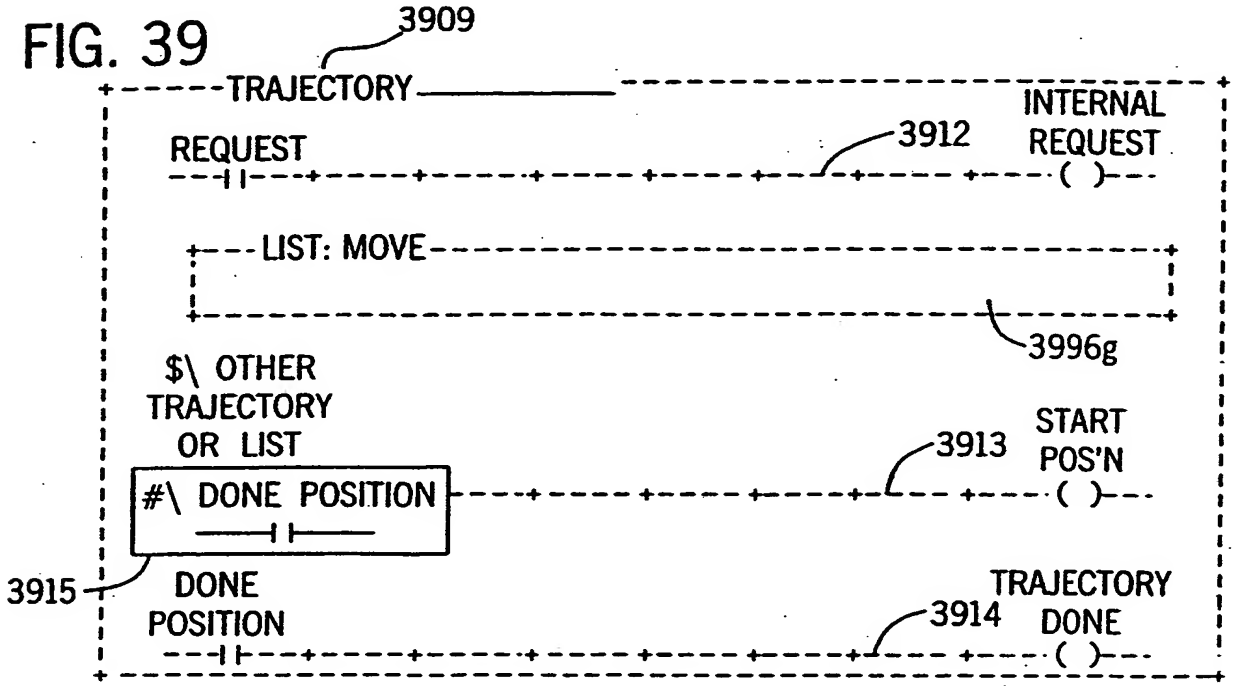


FIG. 40

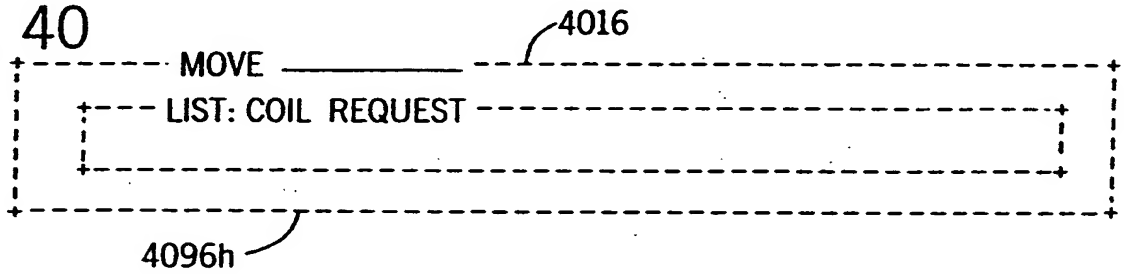


FIG. 41

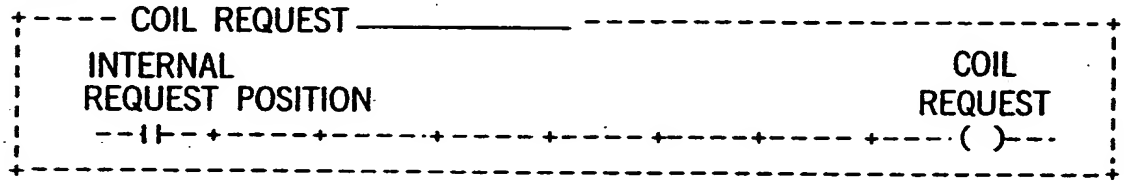


FIG. 42

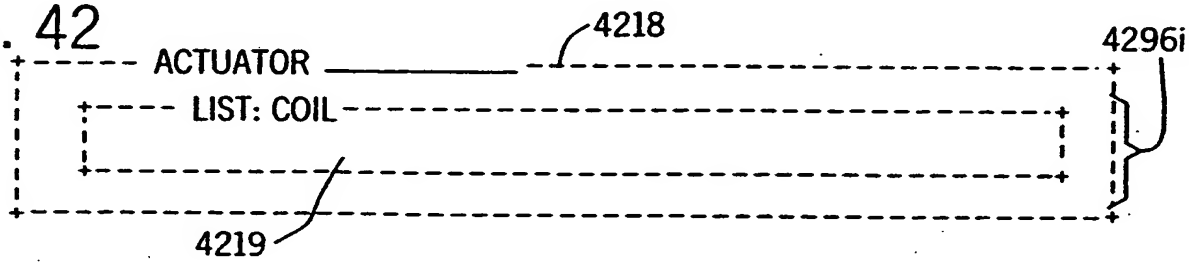


FIG. 43

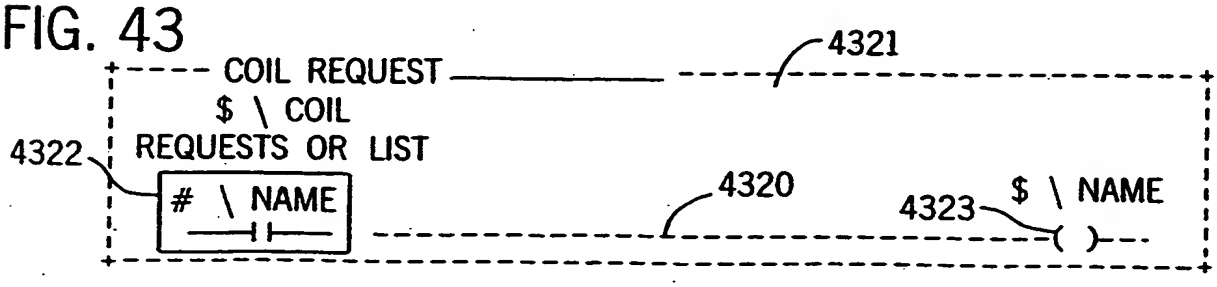


FIG. 44

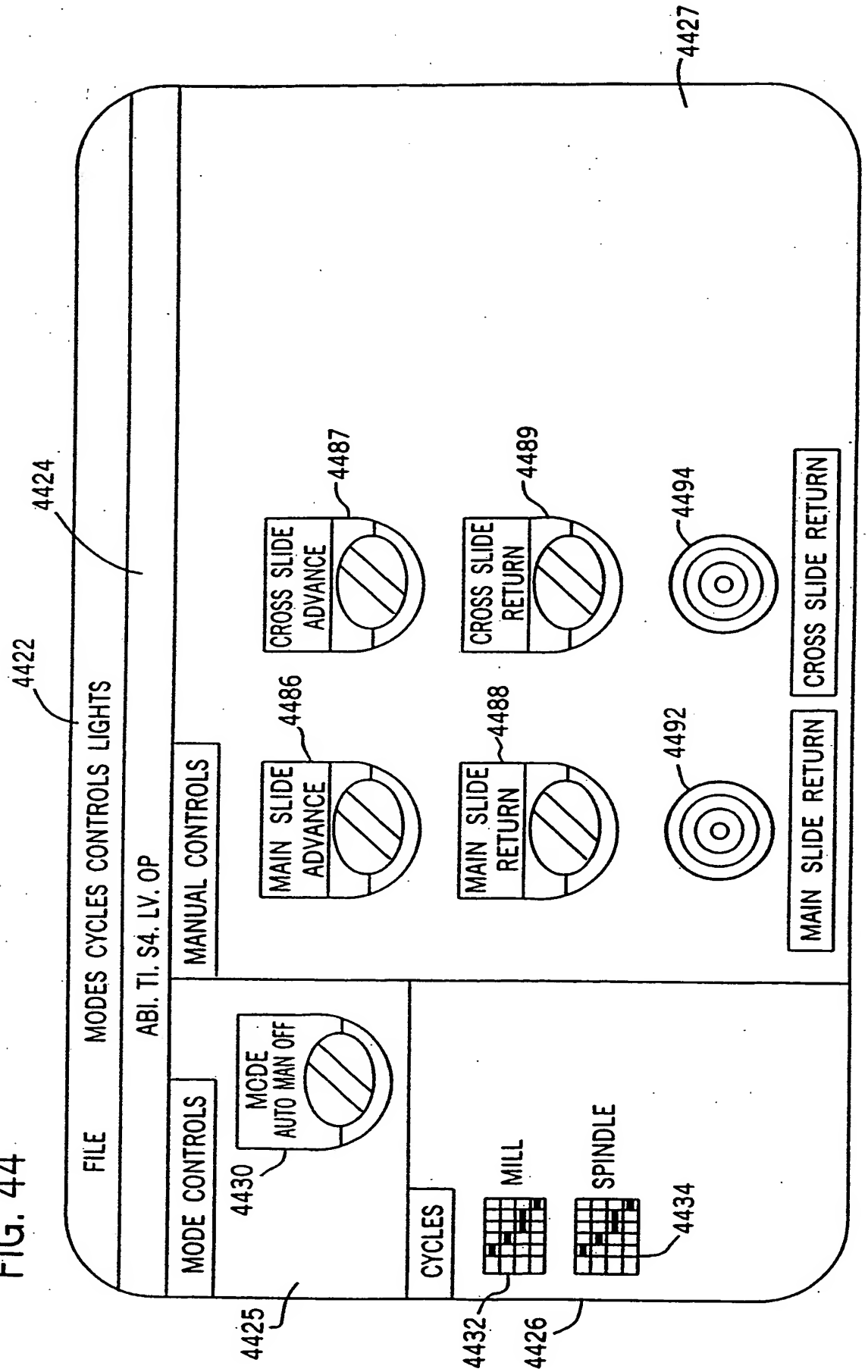

4427
4424
4422
FILE
MODES CYCLES CONTROLS LIGHTS
ABI. TI. S4. LV. OP
MANUAL CONTROLS
MODE CONTROLS
MODE AUTO MAN OFF
4430
CYCLES
MILL
SPINDLE
4434
4425
4432
4426
CROSS SLIDE ADVANCE
4487
CROSS SLIDE RETURN
4489
4494
MAIN SLIDE ADVANCE
4486
MAIN SLIDE RETURN
4488
4492
MAIN SLIDE RETURN
CROSS SLIDE RETURN

FIG. 45

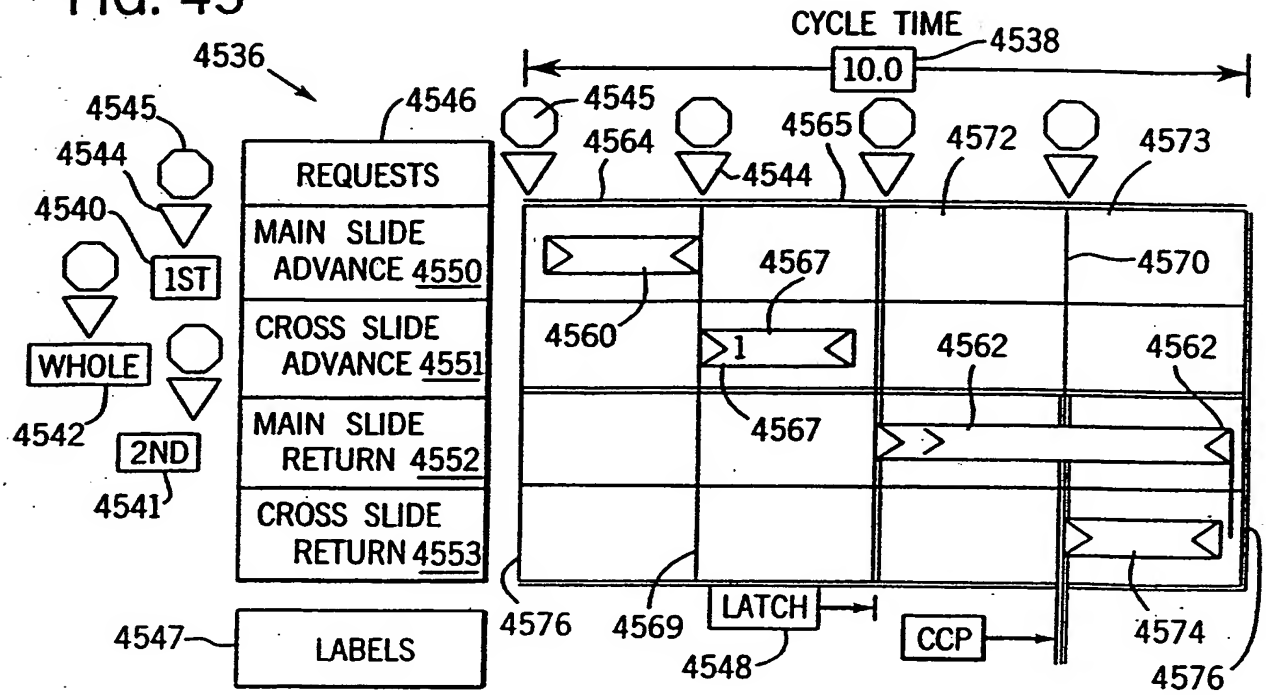
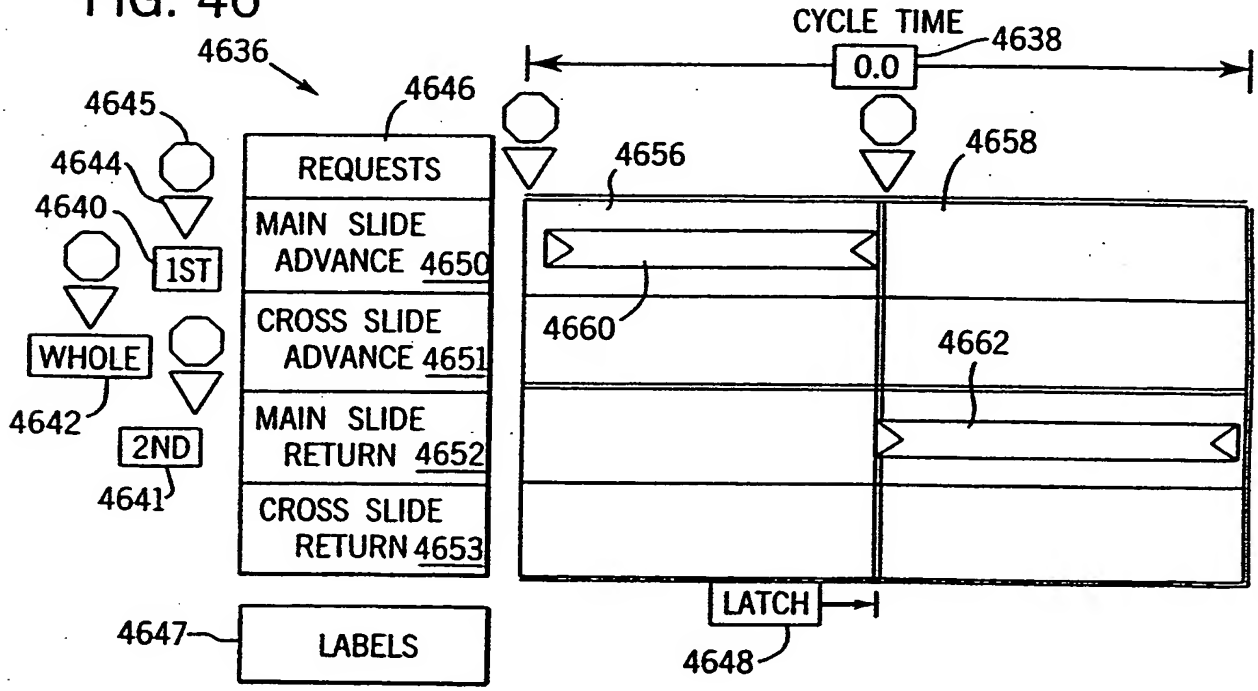

4536
4546
CYCLE TIME
4538
10.0
4545
4544
4540
1ST
WHOLE
4542
2ND
4541
REQUESTS
MAIN SLIDE ADVANCE 4550
CROSS SLIDE ADVANCE 4551
MAIN SLIDE RETURN 4552
CROSS SLIDE RETURN 4553
4547
LABELS
4564
4565
4572
4573
4567
4570
4560
1
4562
4576
4569
LATCH
4548
CCP
4574

FIG. 46


4636
4646
CYCLE TIME
4638
0.0
4645
4644
4640
1ST
WHOLE
4642
2ND
4641
REQUESTS
MAIN SLIDE ADVANCE 4650
CROSS SLIDE ADVANCE 4651
MAIN SLIDE RETURN 4652
CROSS SLIDE RETURN 4653
4647
LABELS
4656
4658
4660
4662
LATCH
4648

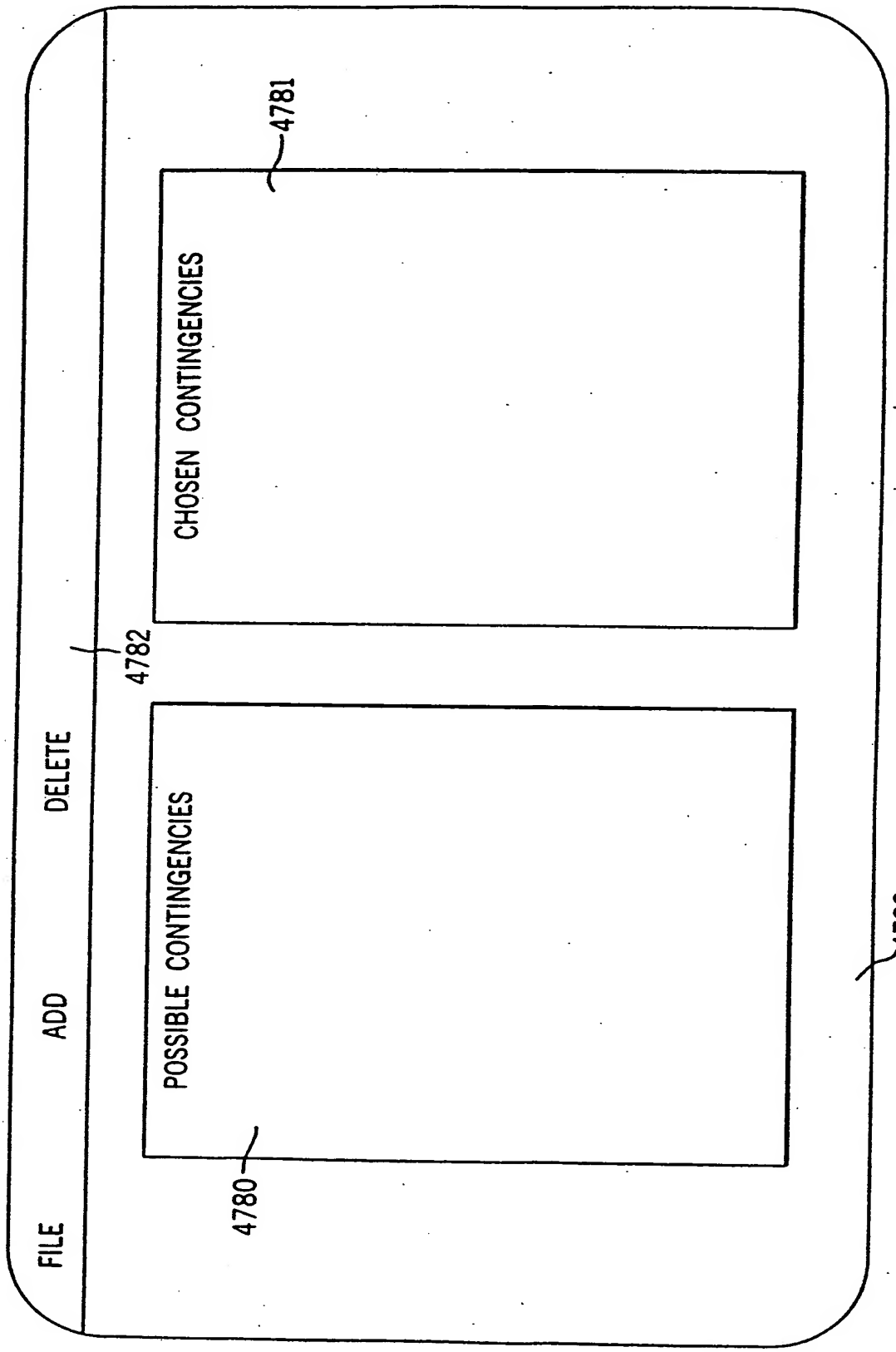

4781
CHOSEN CONTINGENCIES
4782
POSSIBLE CONTINGENCIES
4780
FILE
ADD
DELETE
4702

FIG. 47

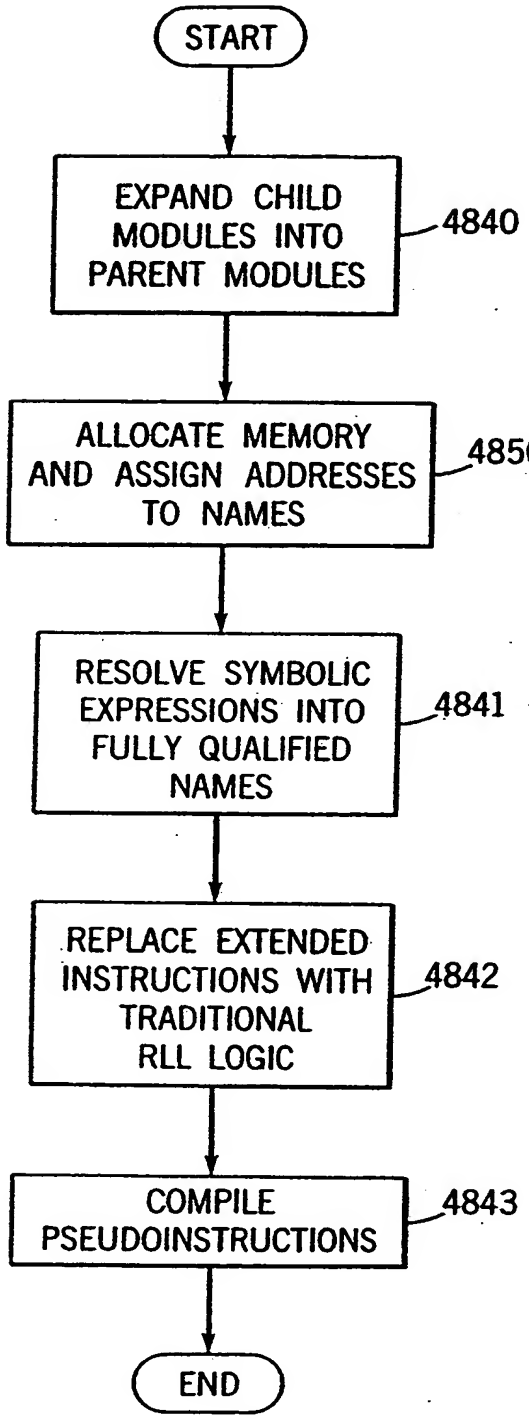

START
EXPAND CHILD MODULES INTO PARENT MODULES
4840
ALLOCATE MEMORY AND ASSIGN ADDRESSES TO NAMES
4850
RESOLVE SYMBOLIC EXPRESSIONS INTO FULLY QUALIFIED NAMES
4841
REPLACE EXTENDED INSTRUCTIONS WITH TRADITIONAL RLL LOGIC
4842
COMPILE PSEUDOINSTRUCTIONS
4843
END

FIG. 48

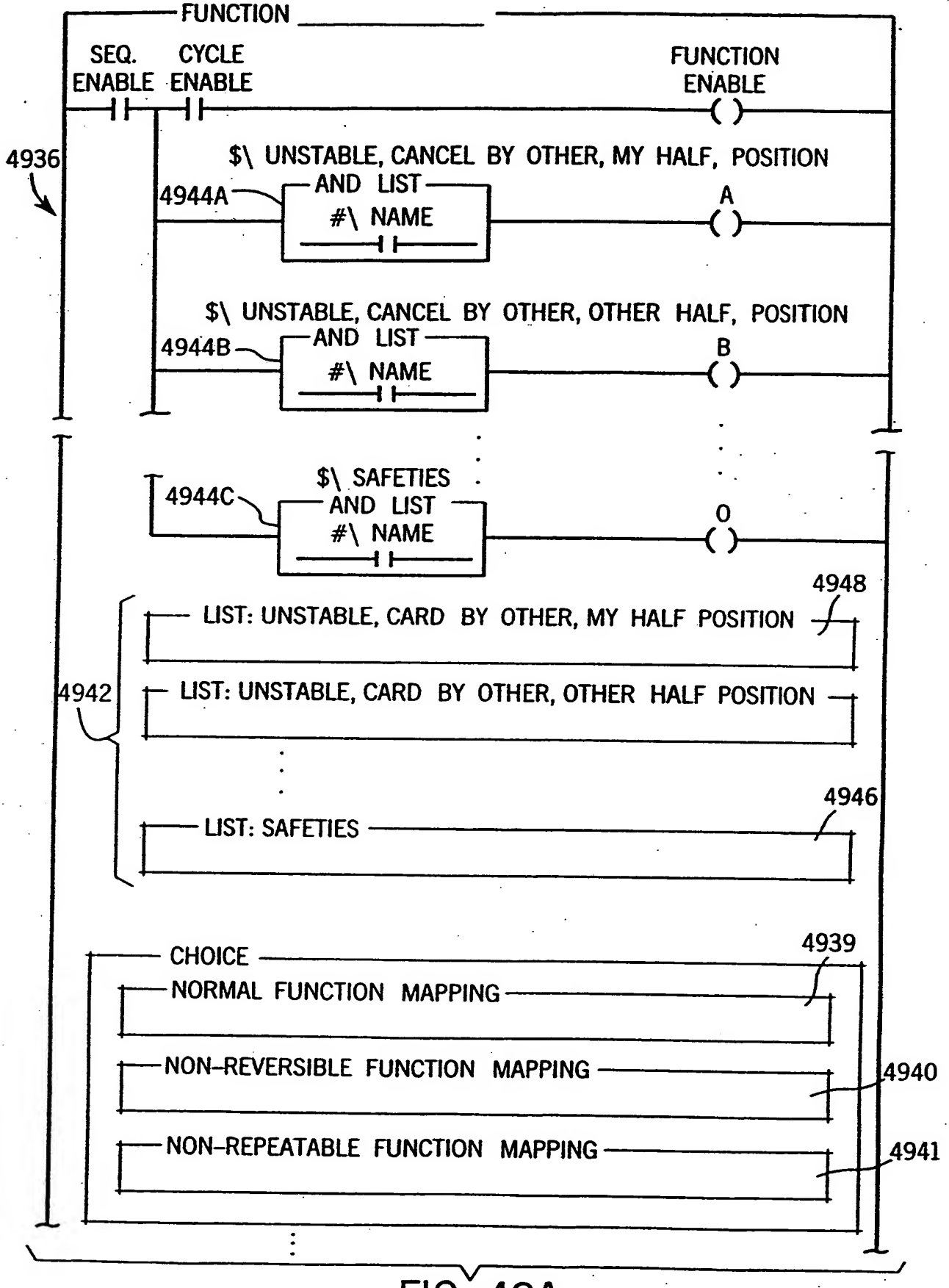

FUNCTION
SEQ. ENABLE
CYCLE ENABLE
FUNCTION ENABLE
4936
$\ UNSTABLE, CANCEL BY OTHER, MY HALF, POSITION
4944A
AND LIST
#\ NAME
A
$\ UNSTABLE, CANCEL BY OTHER, OTHER HALF, POSITION
4944B
AND LIST
#\ NAME
B
$\ SAFETIES
4944C
AND LIST
#\ NAME
O
4948
LIST: UNSTABLE, CARD BY OTHER, MY HALF POSITION
4942
LIST: UNSTABLE, CARD BY OTHER, OTHER HALF POSITION
4946
LIST: SAFETIES
4939
CHOICE
NORMAL FUNCTION MAPPING
NON-REVERSIBLE FUNCTION MAPPING
4940
NON-REPEATABLE FUNCTION MAPPING
4941

FIG. 49A

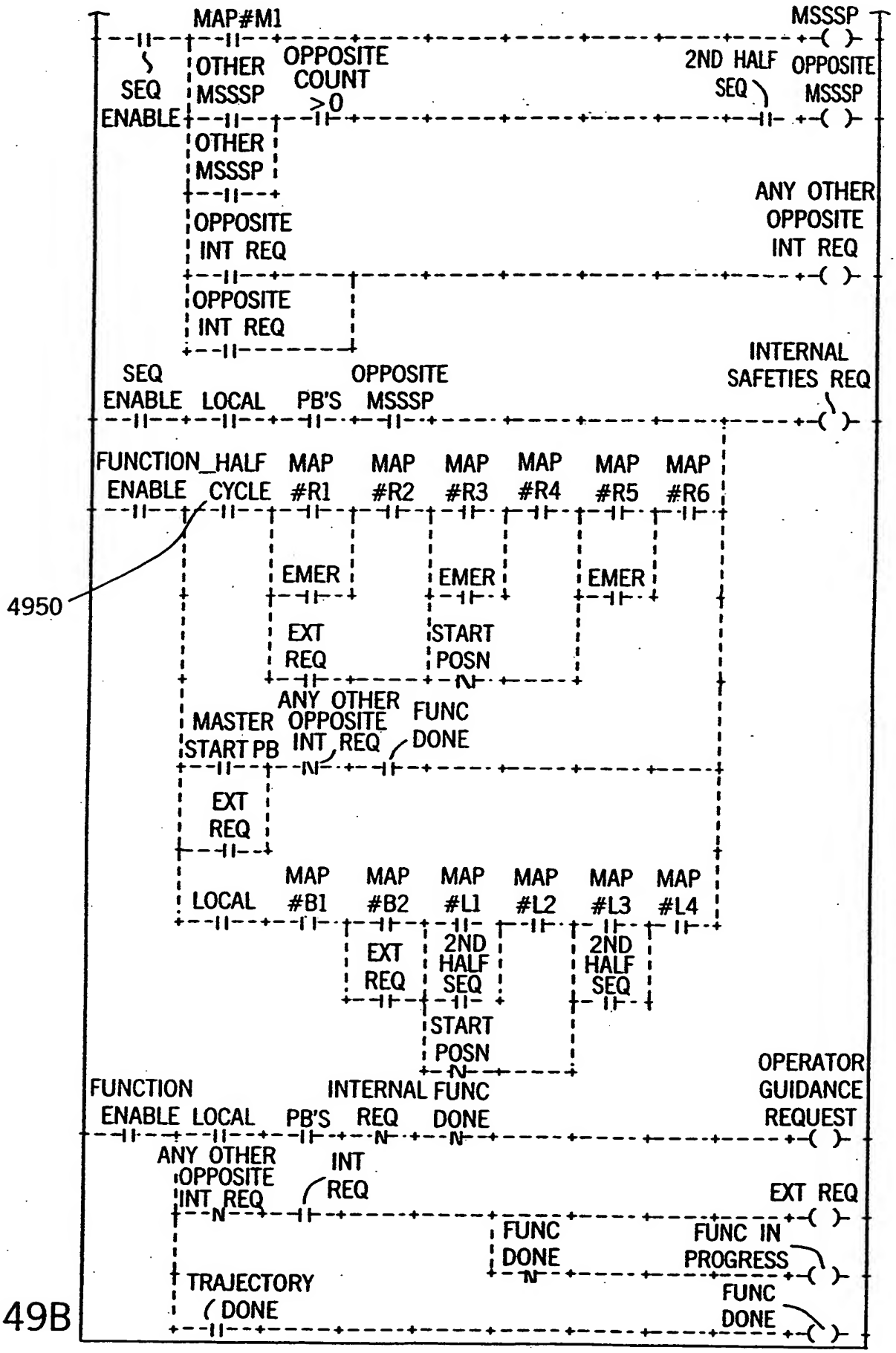

MAP#M1
MSSSP
SEQ ENABLE
OTHER MSSSP
OPPOSITE COUNT >0
2ND HALF SEQ
OPPOSITE MSSSP
OTHER MSSSP
OPPOSITE INT REQ
ANY OTHER OPPOSITE INT REQ
OPPOSITE INT REQ
SEQ ENABLE
LOCAL PB'S
OPPOSITE MSSSP
INTERNAL SAFETIES REQ
FUNCTION_HALF ENABLE
CYCLE
MAP #R1
MAP #R2
MAP #R3
MAP #R4
MAP #R5
MAP #R6
4950
EMER
EXT REQ
EMER
START POSN
EMER
ANY OTHER OPPOSITE INT REQ
MASTER START PB
FUNC DONE
EXT REQ
LOCAL
MAP #B1
MAP #B2
MAP #L1
MAP #L2
MAP #L3
MAP #L4
EXT REQ
2ND HALF SEQ
2ND HALF SEQ
START POSN
FUNCTION ENABLE
LOCAL PB'S
INTERNAL REQ
FUNC DONE
OPERATOR GUIDANCE REQUEST
ANY OTHER OPPOSITE INT REQ
INT REQ
EXT REQ
FUNC DONE
FUNC IN PROGRESS
TRAJECTORY DONE
FUNC DONE

FIG. 49B

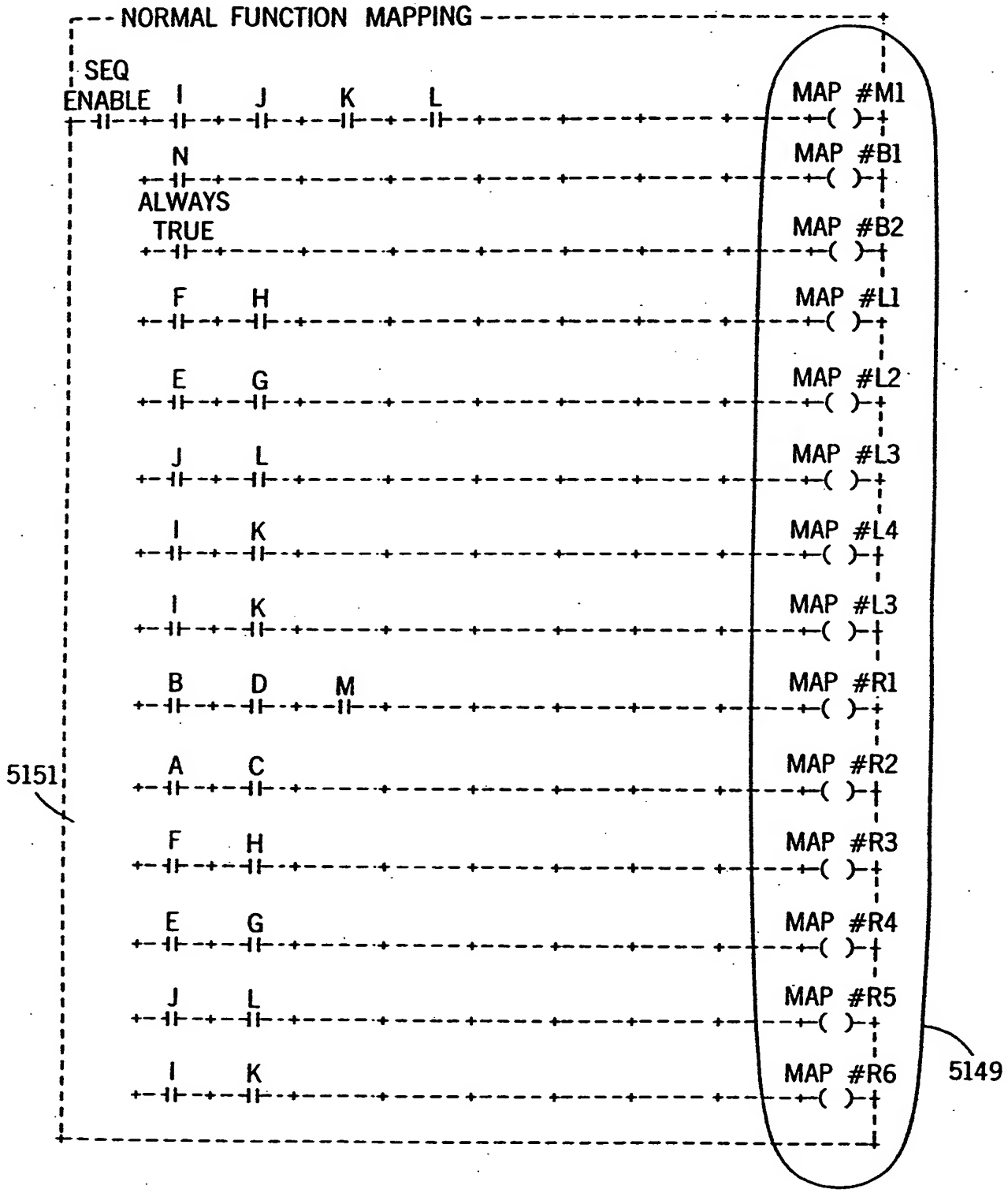
5032

ATTRIBUTES	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
STABLE									X	X	X	X			
UNSTABLE	X	X	X	X	X	X	X	X							
CANC BY OTHER	X	X	X	X											
CANC BY ME					X	X	X	X							
MY HALF OF CYC	X		X		X		X		X		X				
OTHER HALF		X		X		X		X		X		X			
POSITION	X	X			X	X			X	X					
LATCH			X	X			X	X			X	X			
MY START POS													X		
PUSH BUTTON														X	
SAFETY															X

5031

FIG. 50

FIG. 51


NORMAL FUNCTION MAPPING
SEQ ENABLE
I
J
K
L
MAP #M1
N
MAP #B1
ALWAYS TRUE
MAP #B2
F
H
MAP #L1
E
G
MAP #L2
J
L
MAP #L3
I
K
MAP #L4
I
K
MAP #L3
B
D
M
MAP #R1
A
C
MAP #R2
F
H
MAP #R3
E
G
MAP #R4
J
L
MAP #R5
I
K
MAP #R6
5151
5149

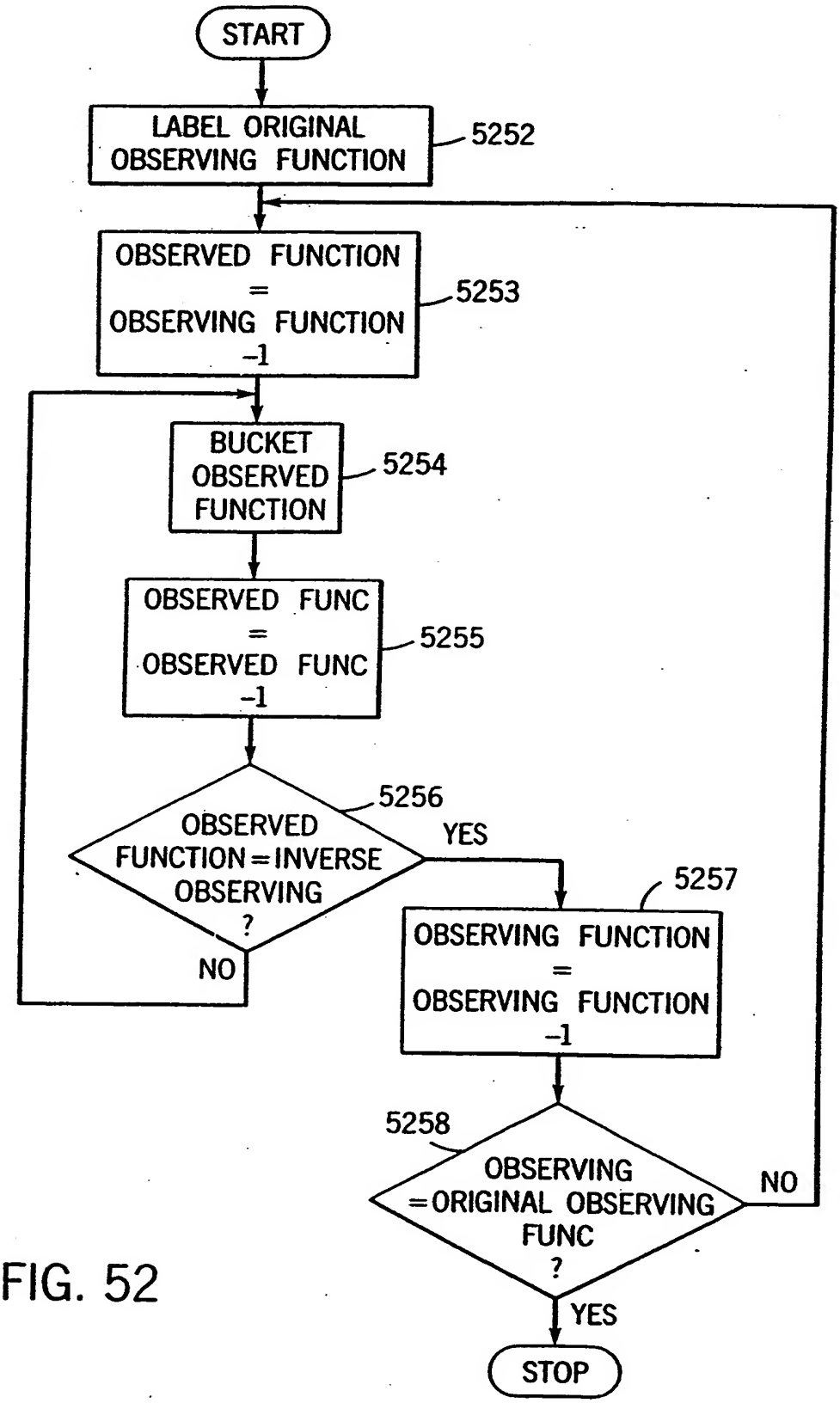
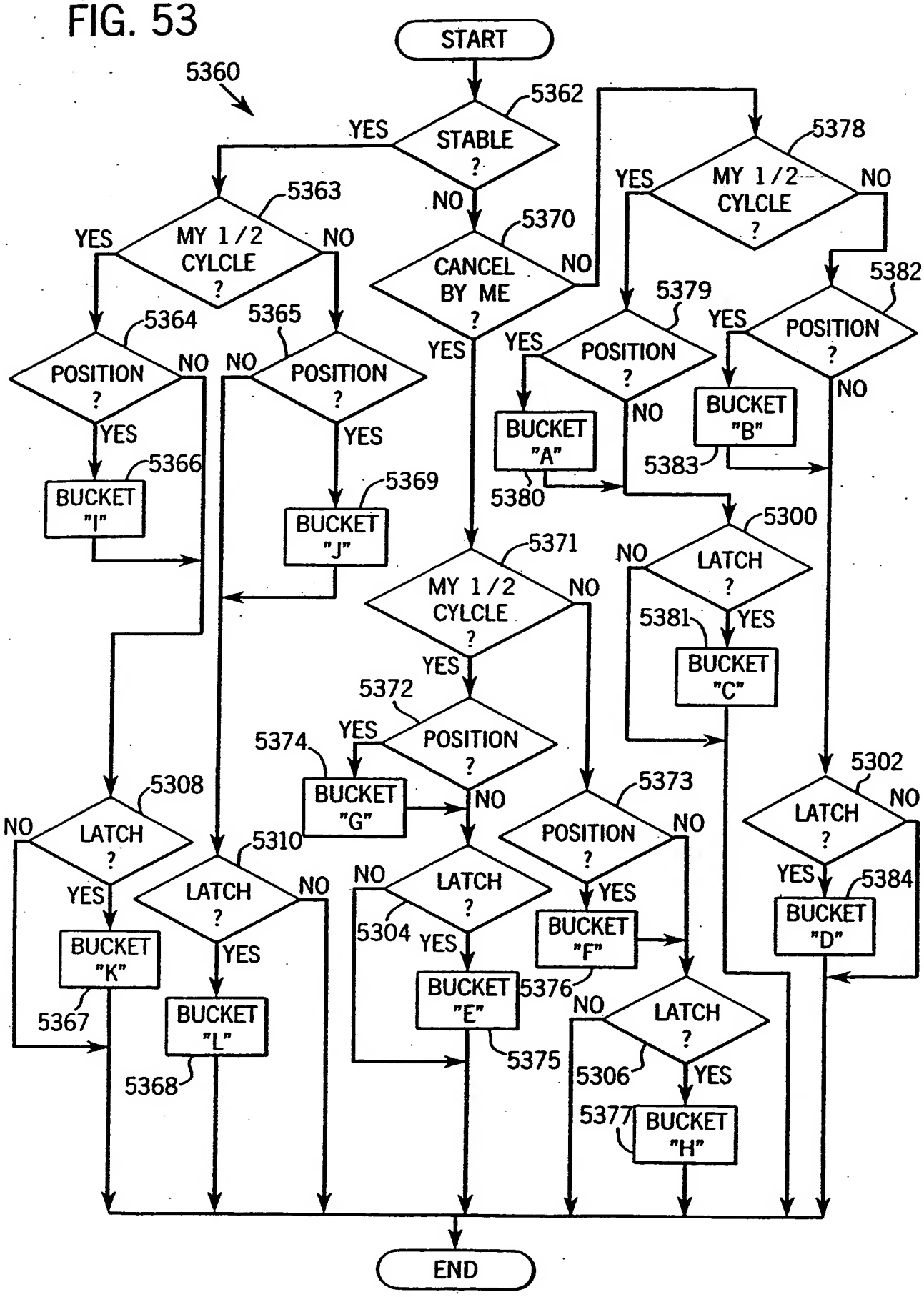

START
LABEL ORIGINAL OBSERVING FUNCTION
5252
OBSERVED FUNCTION = OBSERVING FUNCTION -1
5253
BUCKET OBSERVED FUNCTION
5254
OBSERVED FUNC = OBSERVED FUNC -1
5255
OBSERVED FUNCTION = INVERSE OBSERVING ?
5256
YES
NO
OBSERVING FUNCTION = OBSERVING FUNCTION -1
5257
OBSERVING = ORIGINAL OBSERVING FUNC ?
5258
NO
YES
STOP

FIG. 52

FIG. 53


START
5360
5362
STABLE ?
YES
NO
5363
MY 1/2 CYLCLE ?
YES
NO
5364
POSITION ?
NO
YES
5366
BUCKET "I"
5365
POSITION ?
NO
YES
5369
BUCKET "J"
5370
CANCEL BY ME ?
NO
YES
5371
MY 1/2 CYLCLE ?
NO
YES
5372
POSITION ?
YES
5374
BUCKET "G"
NO
5373
POSITION ?
NO
YES
5378
MY 1/2 CYLCLE ?
YES
NO
5379
POSITION ?
YES
NO
5380
BUCKET "A"
5382
POSITION ?
YES
NO
BUCKET "B"
5383
5300
LATCH ?
NO
5381
YES
BUCKET "C"
5302
LATCH ?
NO
YES
5384
BUCKET "D"
5308
LATCH ?
NO
YES
BUCKET "K"
5367
5310
LATCH ?
NO
YES
BUCKET "L"
5368
LATCH ?
NO
5304
YES
BUCKET "E"
5375
BUCKET "F"
5376
LATCH ?
NO
5306
YES
5377
BUCKET "H"
END

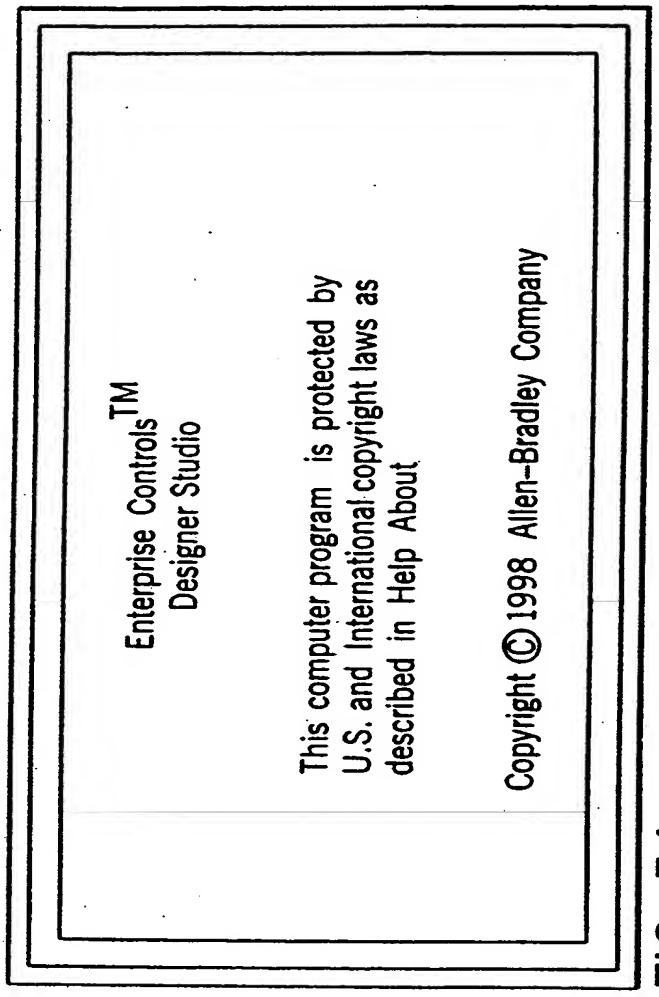

Enterprise Controls™
Designer Studio
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FIG. 54

FIG. 55

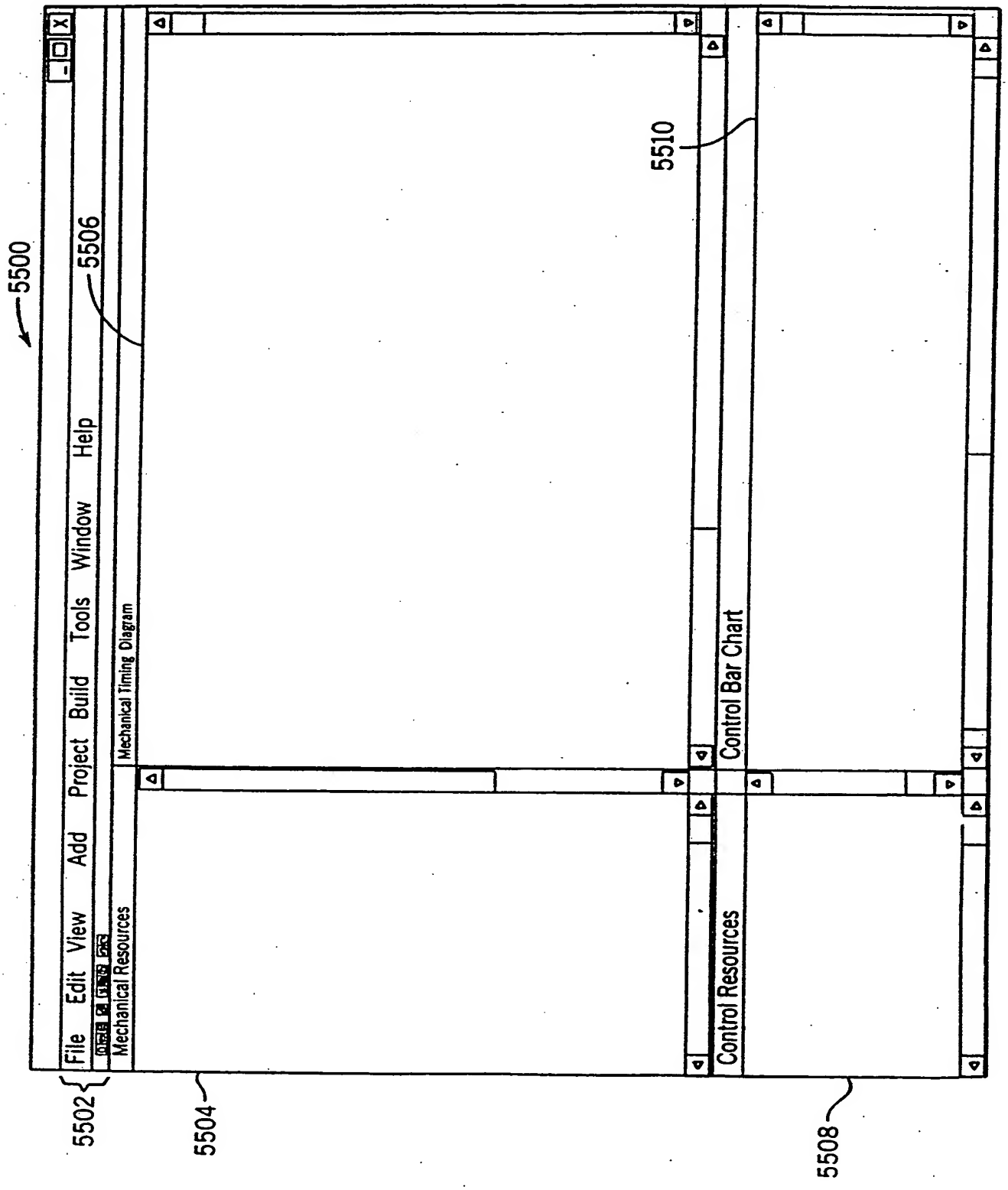

5500
5506
5510
File Edit View Add Project Build Tools Window Help
Mechanical Timing Diagram
Mechanical Resources
Control Bar Chart
Control Resources
5502
5504
5508

FIG. 56

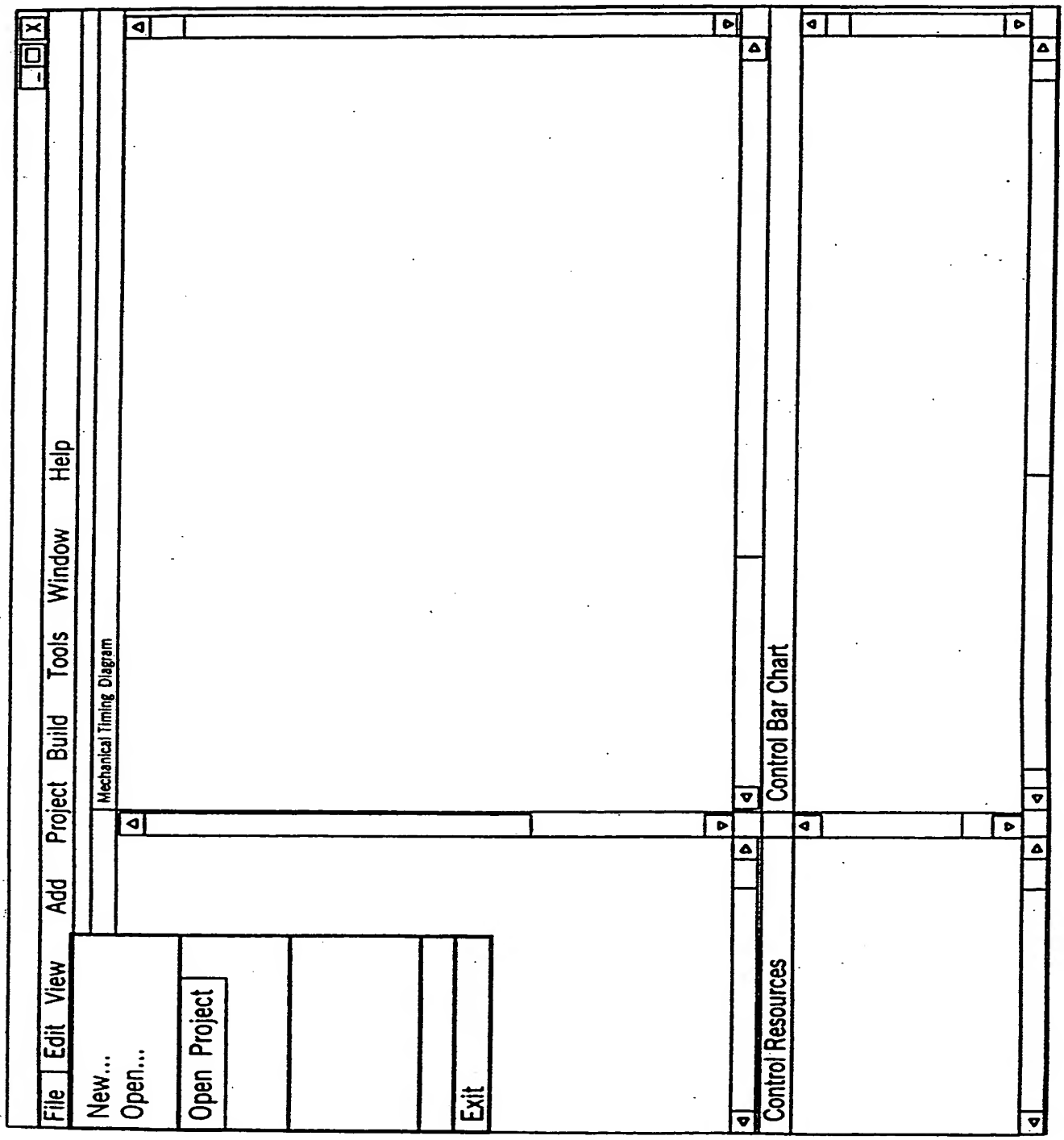

File
Edit
View
Add
Project
Build
Tools
Window
Help
New...
Open...
Open Project
Exit
Mechanical Timing Diagram
Control Bar Chart
Control Resources

FIG. 57

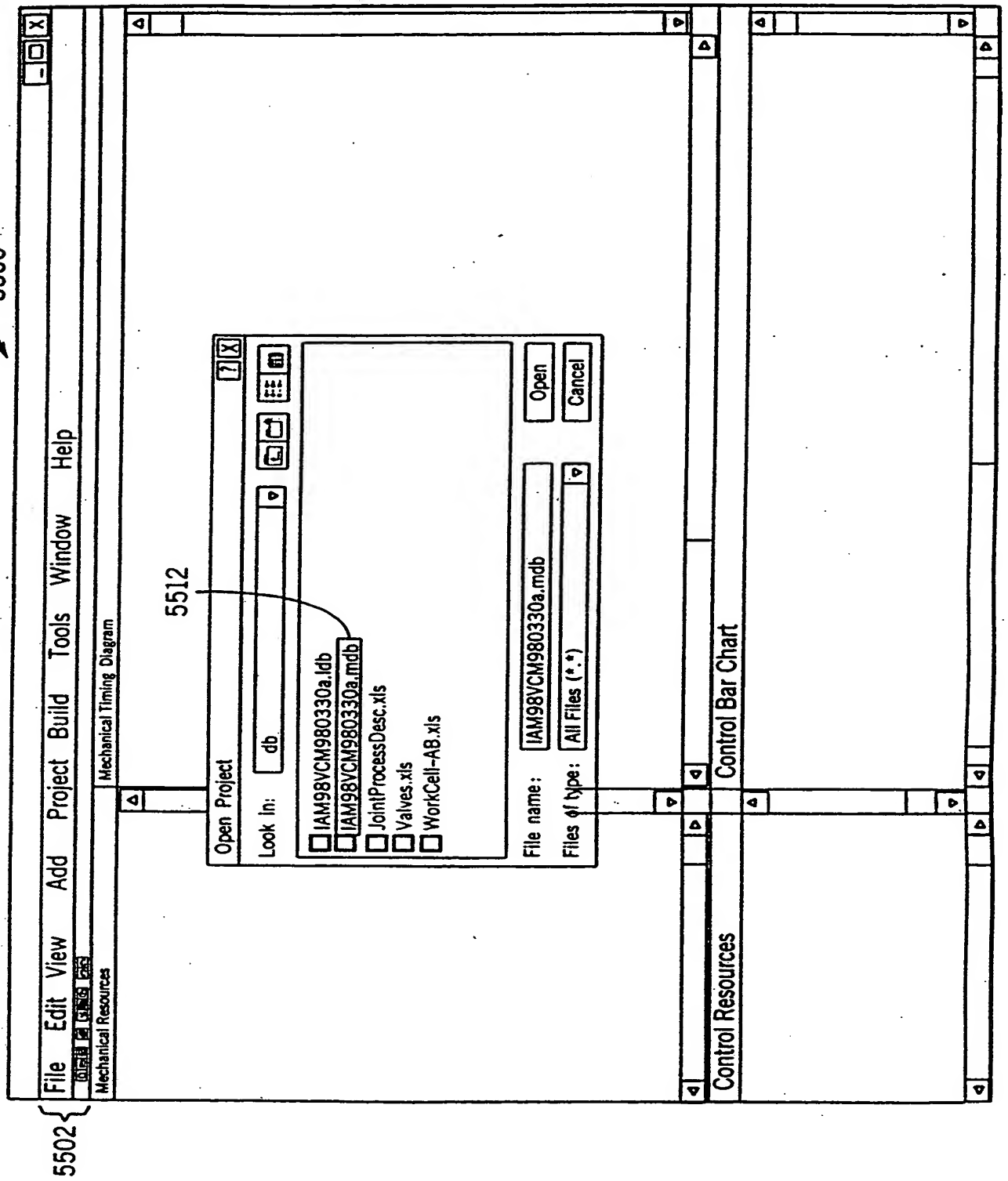

5500
5502
5512
File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
Open Project
Look In:
db
IAM98VCM980330a.ldb
IAM98VCM980330a.mdb
JoinIProcessDesc.xls
Valves.xls
WorkCell-AB.xls
File name:
IAM98VCM980330a.mdb
Files of type:
All Files (*.*)
Open
Cancel
Control Bar Chart
Control Resources

FIG. 58

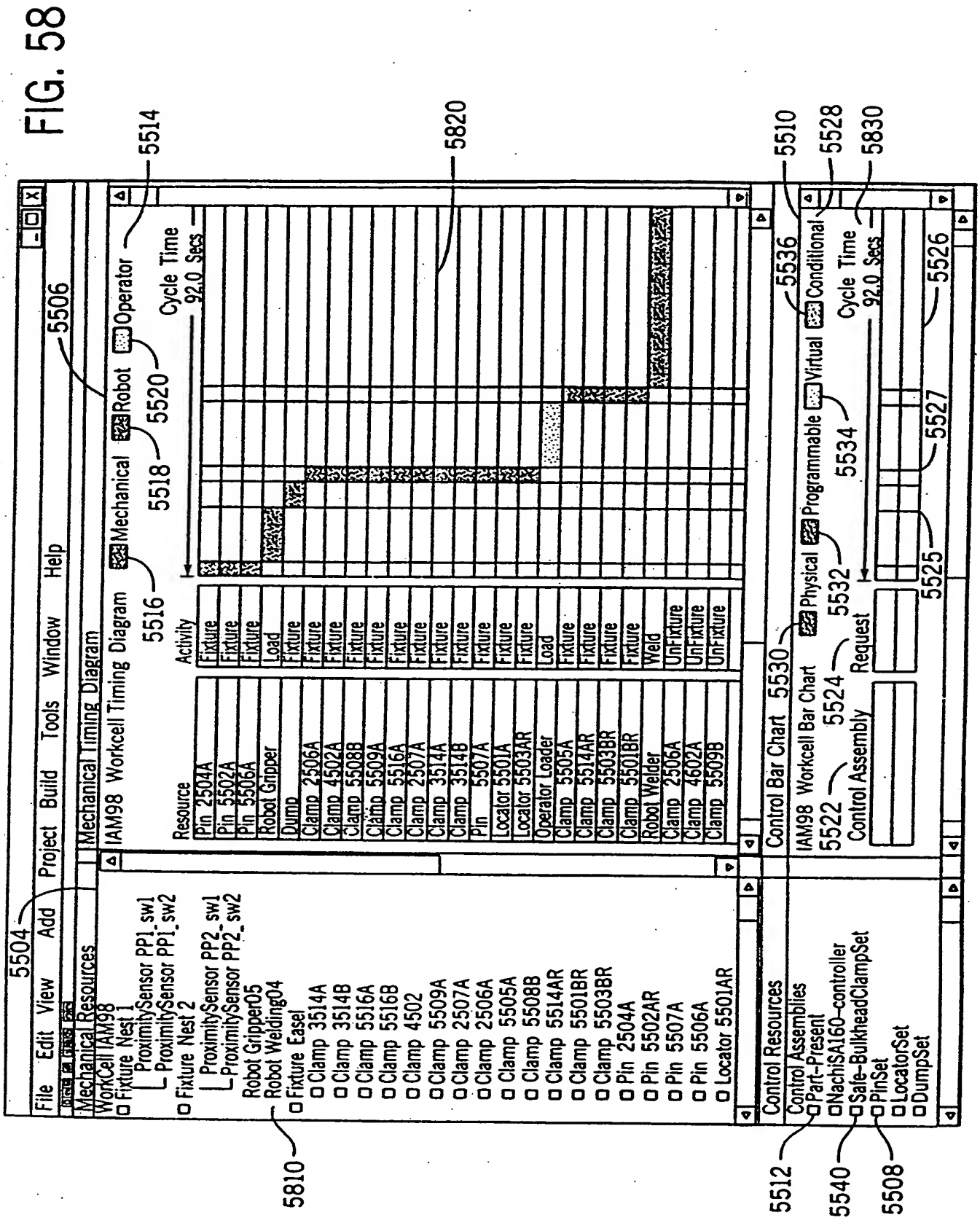

5504
5506
5514
5820
5510
5528
5830
5516
5518
5520
5536
5526
5527
5534
5532
5525
5524
5522
5530
5810
5512
5540
5508
File Edit View Add Project Build Tools Window Help
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Pin 2504A
Pin 5502AR
Pin 5507A
Pin 5506A
Locator 5501AR
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Clamp 5503BR
Clamp 5501BR
Robot Welder
Clamp 2506A
Clamp 4602A
Clamp 5509B
Fixture
Load
Weld
UnFixture
Control Bar Chart
IAM98 Workcell Bar Chart
Control Assembly
Physical
Programmable
Virtual
Conditional
Request
Cycle Time
92.0 Secs

FIG. 59

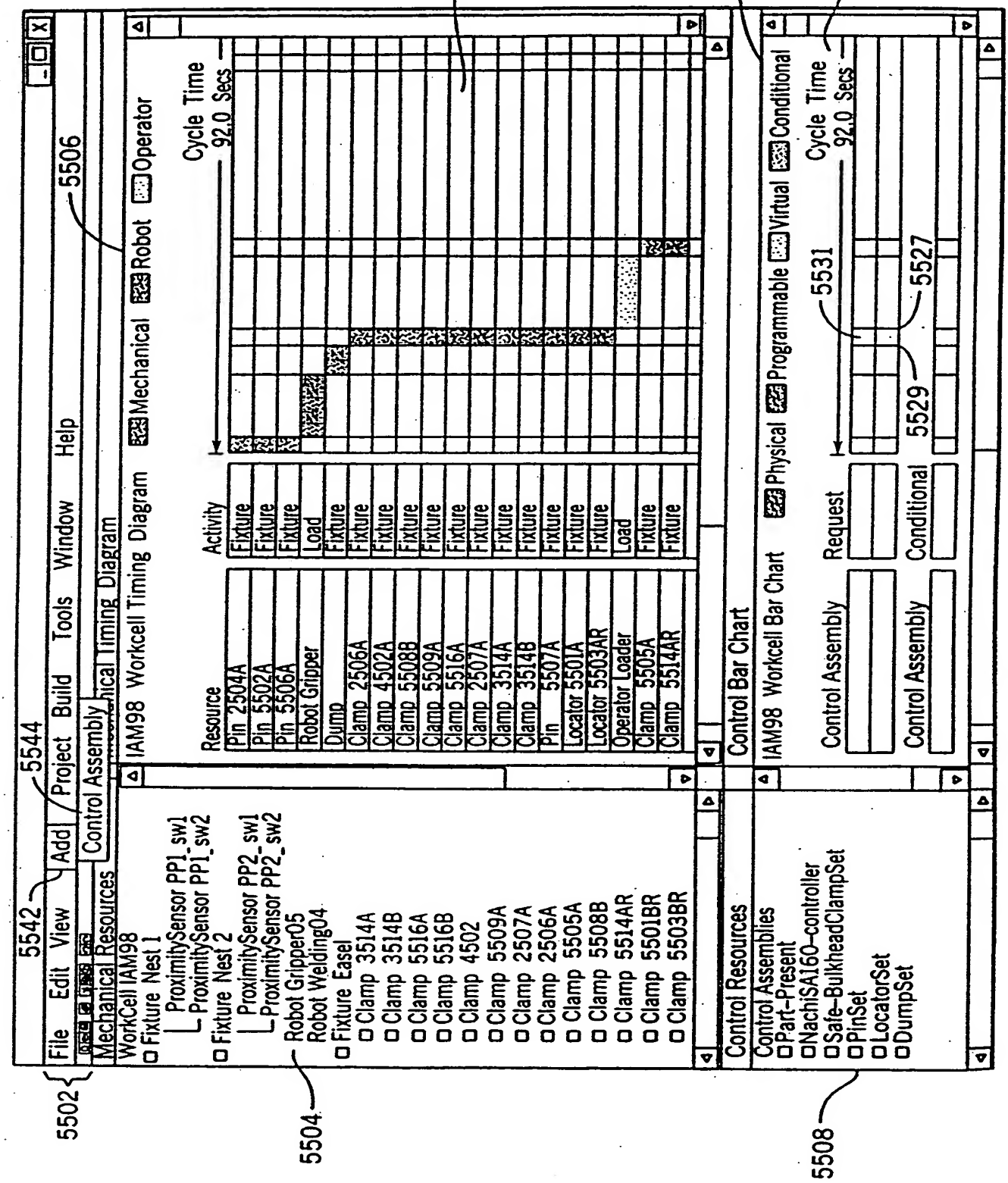

5502
5504
5506
5508
5510
5527
5529
5530
5531
5542
5544
5820
File Edit View Add Project Build Tools Window Help
Mechanical Resources
Control Assembly
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Control Bar Chart
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Control Assembly
Request
Conditional

FIG. 60

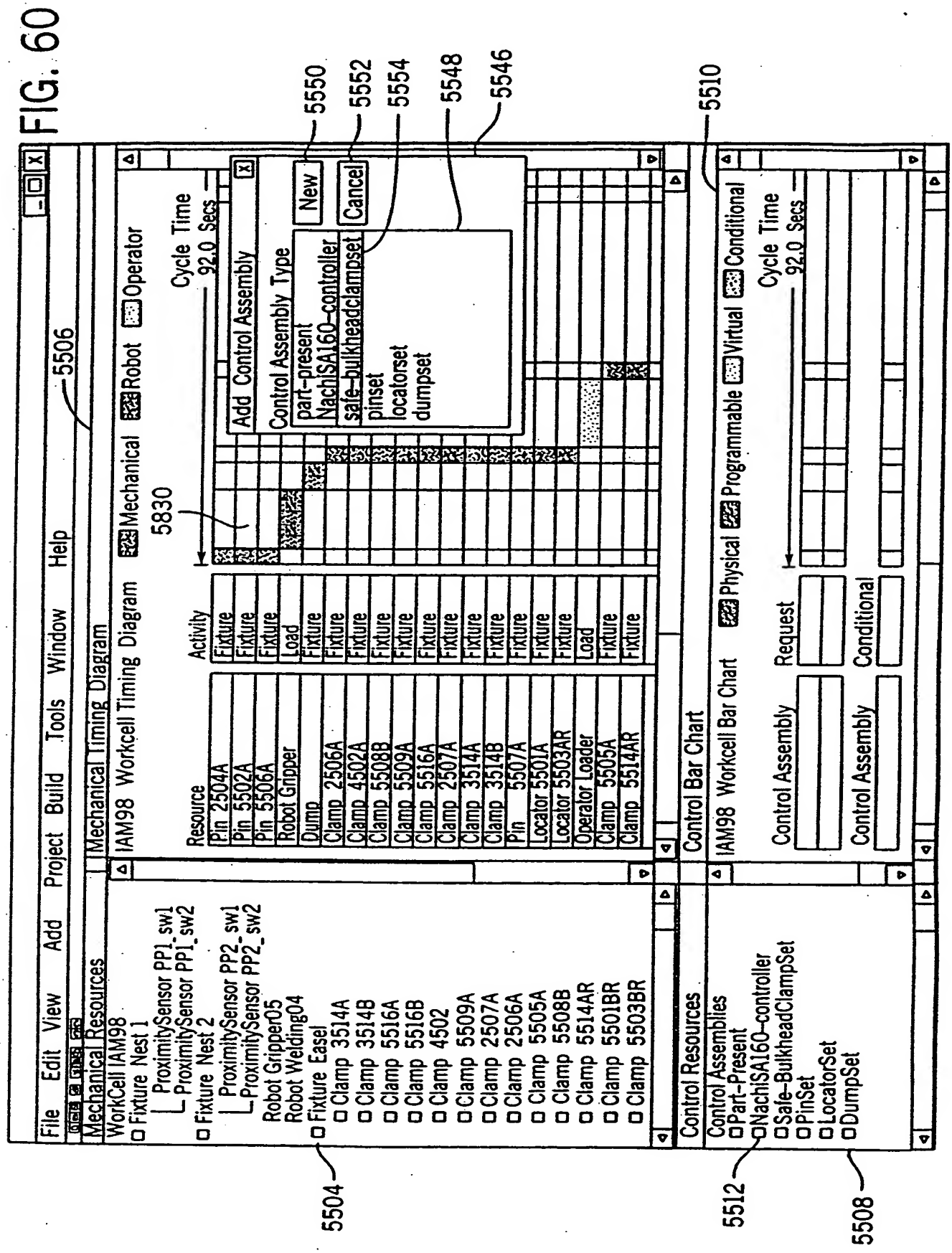

File Edit View Add Project Build Tools Window Help
5506
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
5830
Activity
Resource
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
5550
5552
5554
5548
5546
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
Control Assembly
Request
Control Assembly
Conditional
5510
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
5504
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
5512
5508

FIG. 61

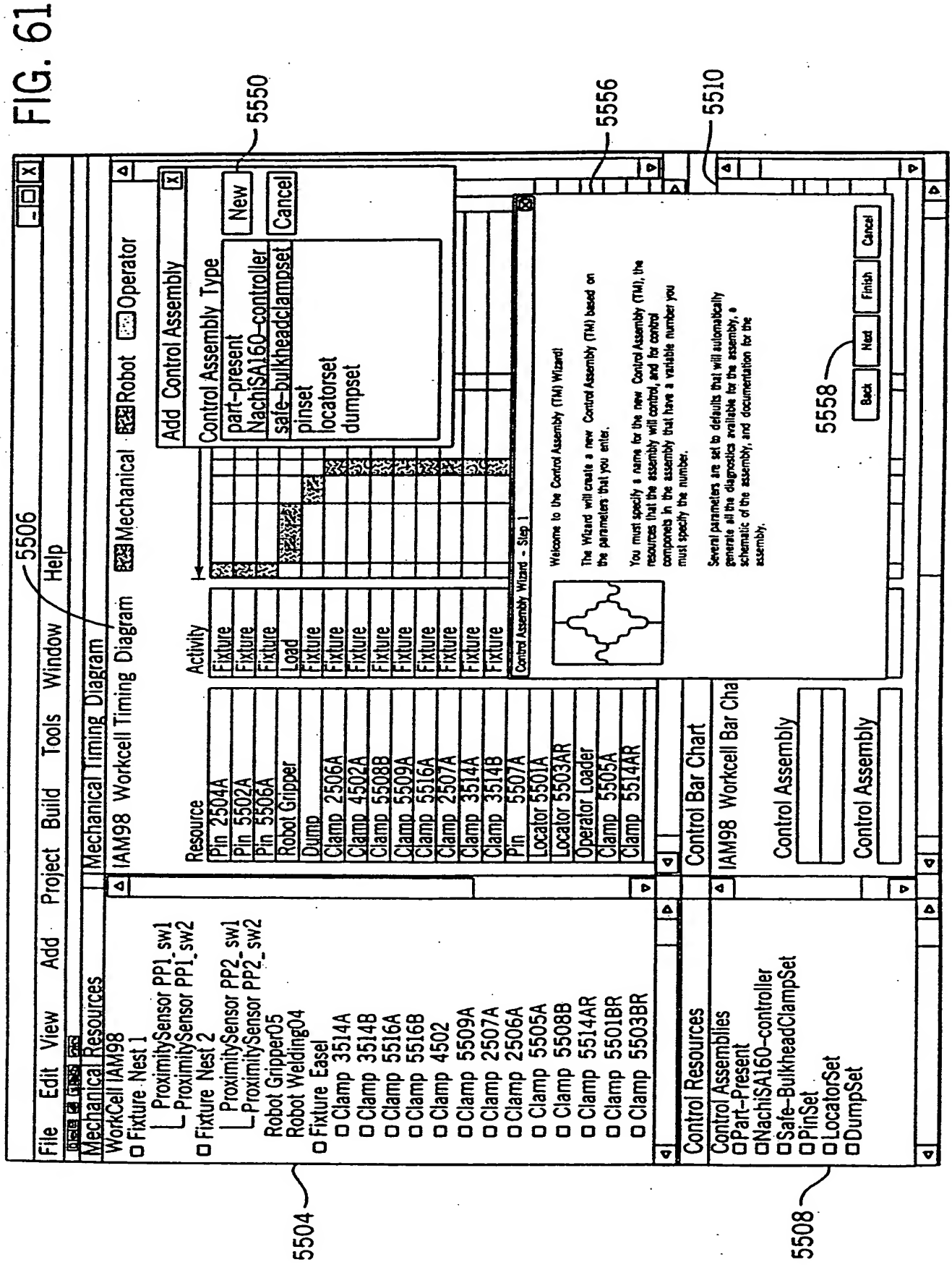

5506
5550
5556
5510
5558
5504
5508
File Edit View Add Project Build Tools Window Help
Mechanical Timing Diagram
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 1
Welcome to the Control Assembly (TM) Wizard!
The Wizard will create a new Control Assembly (TM) based on the parameters that you enter.
You must specify a name for the new Control Assembly (TM), the resources that the assembly will control, and for control components in the assembly that have a variable number you must specify the number.
Several parameters are set to defaults that will automatically generate all the diagnostics available for the assembly, a schematic of the assembly, and documentation for the assembly.
Back
Next
Finish
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 62

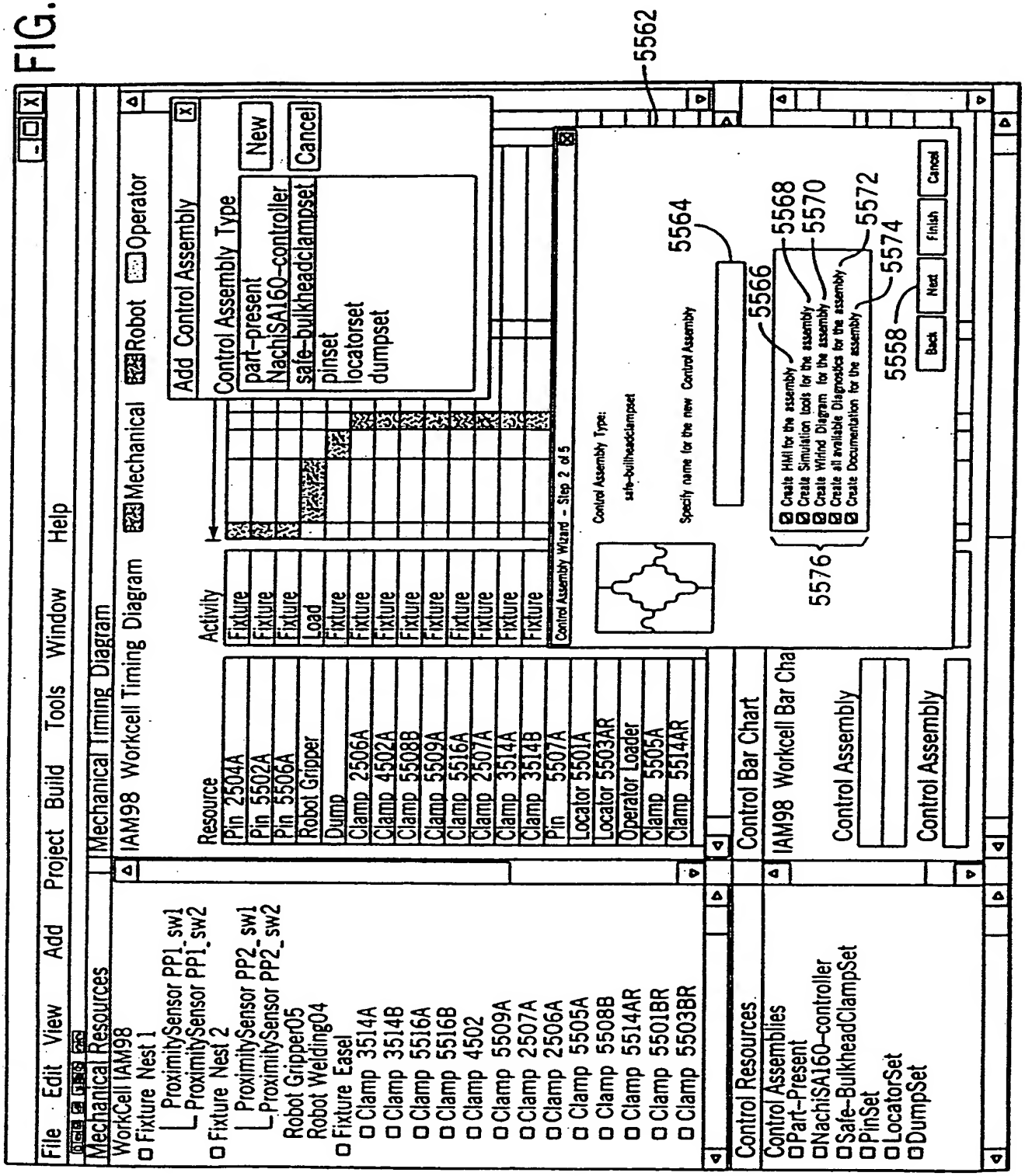

5562
5564
5566
5568
5570
5572
5574
5576
5558
File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 2 of 5
Control Assembly Type:
safe-bulkheadclampset
Specify name for the new Control Assembly
Create HMI for the assembly
Create Simulation tools for the assembly
Create Wiring Diagram for the assembly
Create all available Diagnostics for the assembly
Create Documentation for the assembly
Back
Next
Finish
Cancel
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet

FIG. 63

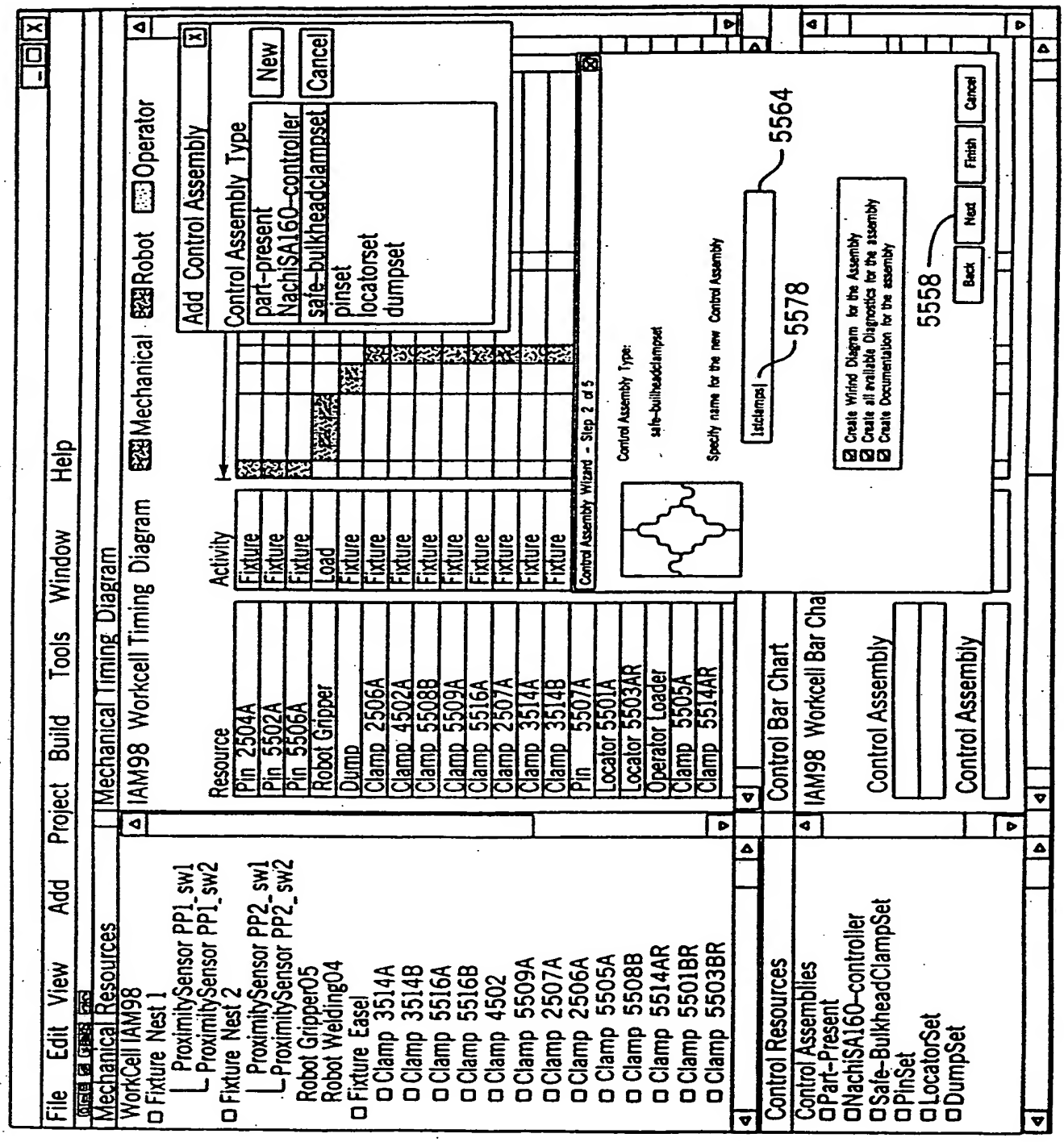

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot GripperO5
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 2 of 5
Control Assembly Type:
safe-bulkheadclampset
Specify name for the new Control Assembly
1stclampsl
5564
5578
Create Wiring Diagram for the Assembly
Create all available Diagnostics for the assembly
Create Documentation for the assembly
5558
Back
Next
Finish
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 64

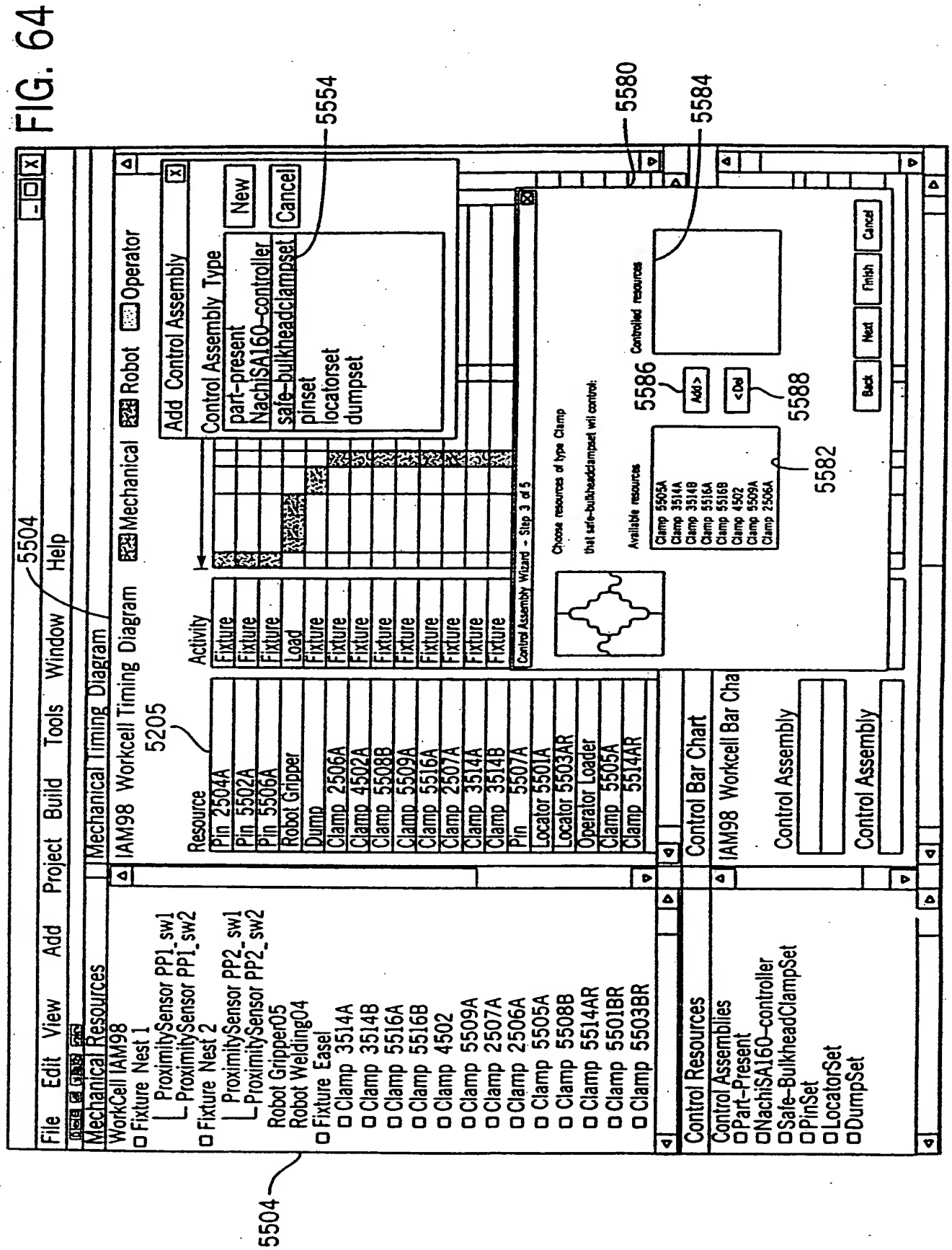

5504
5554
5580
5584
5205
5586
5588
5582
5504
File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Activity
Resource
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 3 of 5
Choose resources of type Clamp
that safe-bulkheadclampset will control:
Available resources
Clamp 5505A
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2506A
Add>
<Del
Controlled resources
Back
Next
Finish
Cancel
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 65

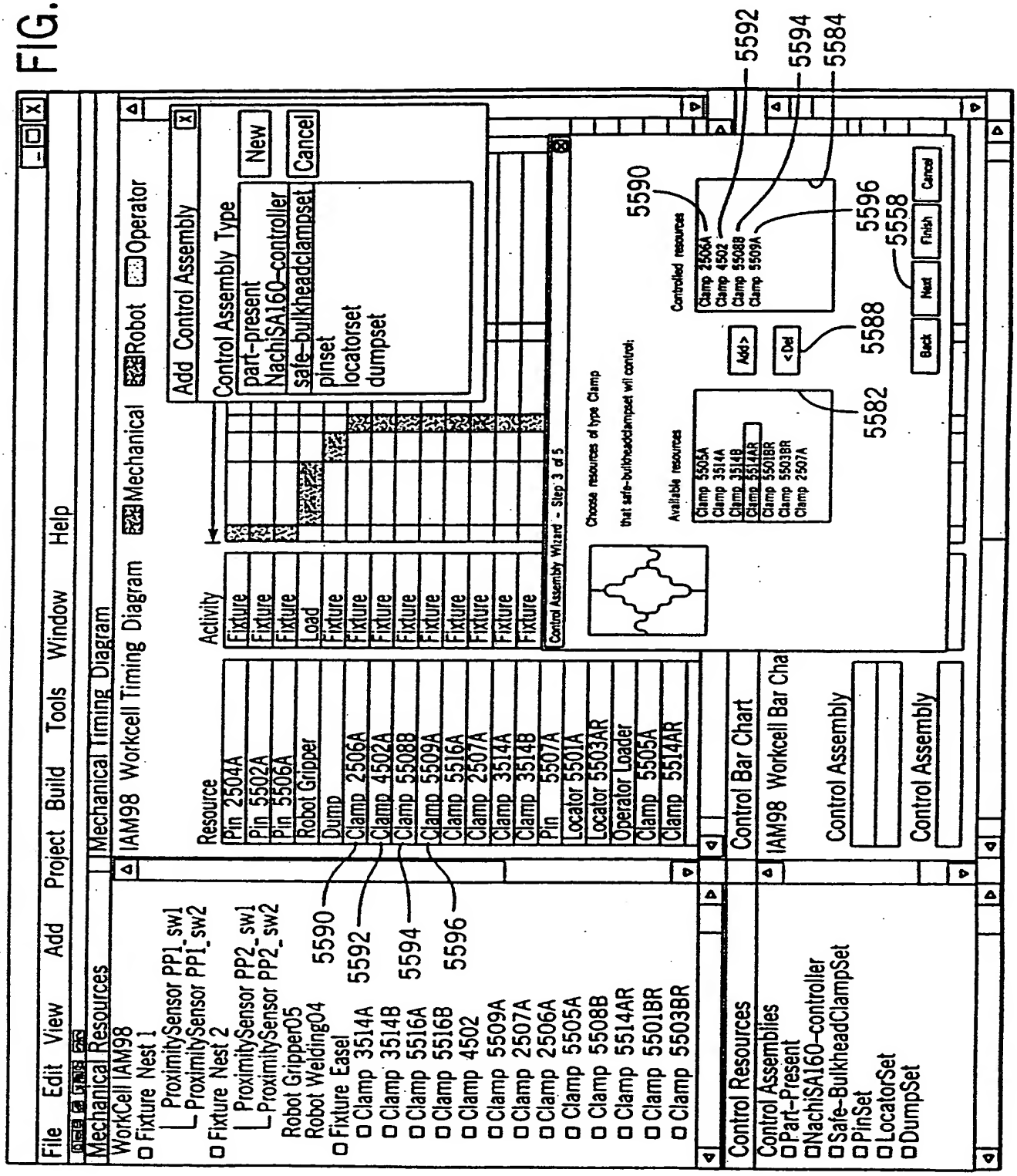

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Activity
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 3 of 5
Choose resources of type Clamp
that safe-bulkheadclampset will control:
Available resources
Clamp 5505A
Clamp 3514A
Clamp 3514B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Clamp 2507A
Add>
<Del
Controlled resources
Clamp 2506A
Clamp 4502
Clamp 5508B
Clamp 5509A
Back
Next
Finish
Cancel
5590
5592
5594
5596
5582
5588
5584
5558
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 66

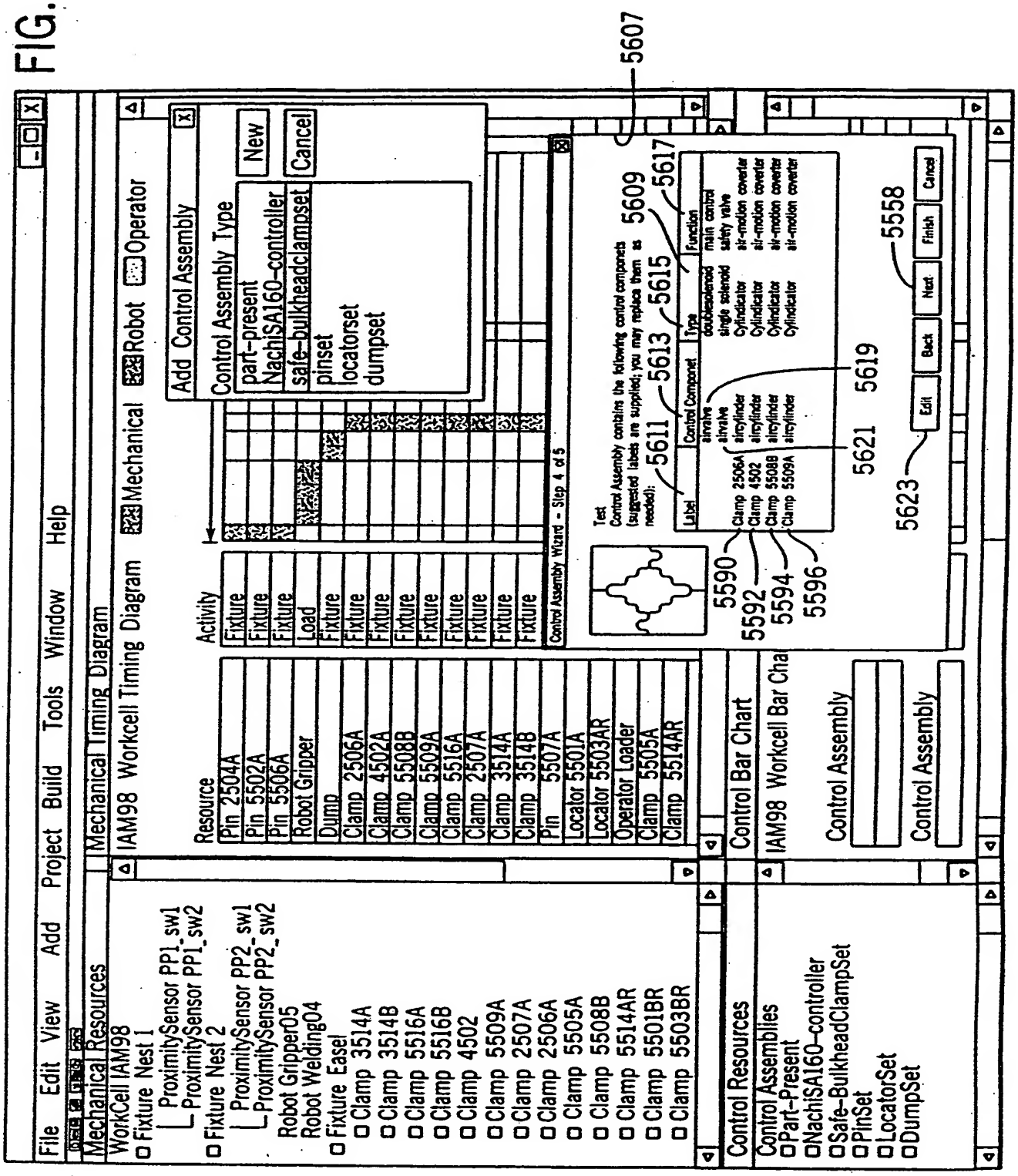

File Edit View Add Project Build Tools Window Help
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 4 of 5
Test
Control Assembly contains the following control components (suggested labels are supplied; you may replace them as needed):
Label
Control Component
Type
Function
Clamp 2506A
Clamp 4502
Clamp 5508B
Clamp 5509A
airvalve
airvalve
aircylinder
aircylinder
aircylinder
aircylinder
doublesolenoid
single solenoid
Cylindicator
Cylindicator
Cylindicator
Cylindicator
main control
safety valve
air-motion coverter
air-motion coverter
air-motion coverter
air-motion coverter
Edit
Back
Next
Finish
Cancel
5607
5609
5611
5613
5615
5617
5619
5621
5623
5590
5592
5594
5596
5558
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet

FIG. 67

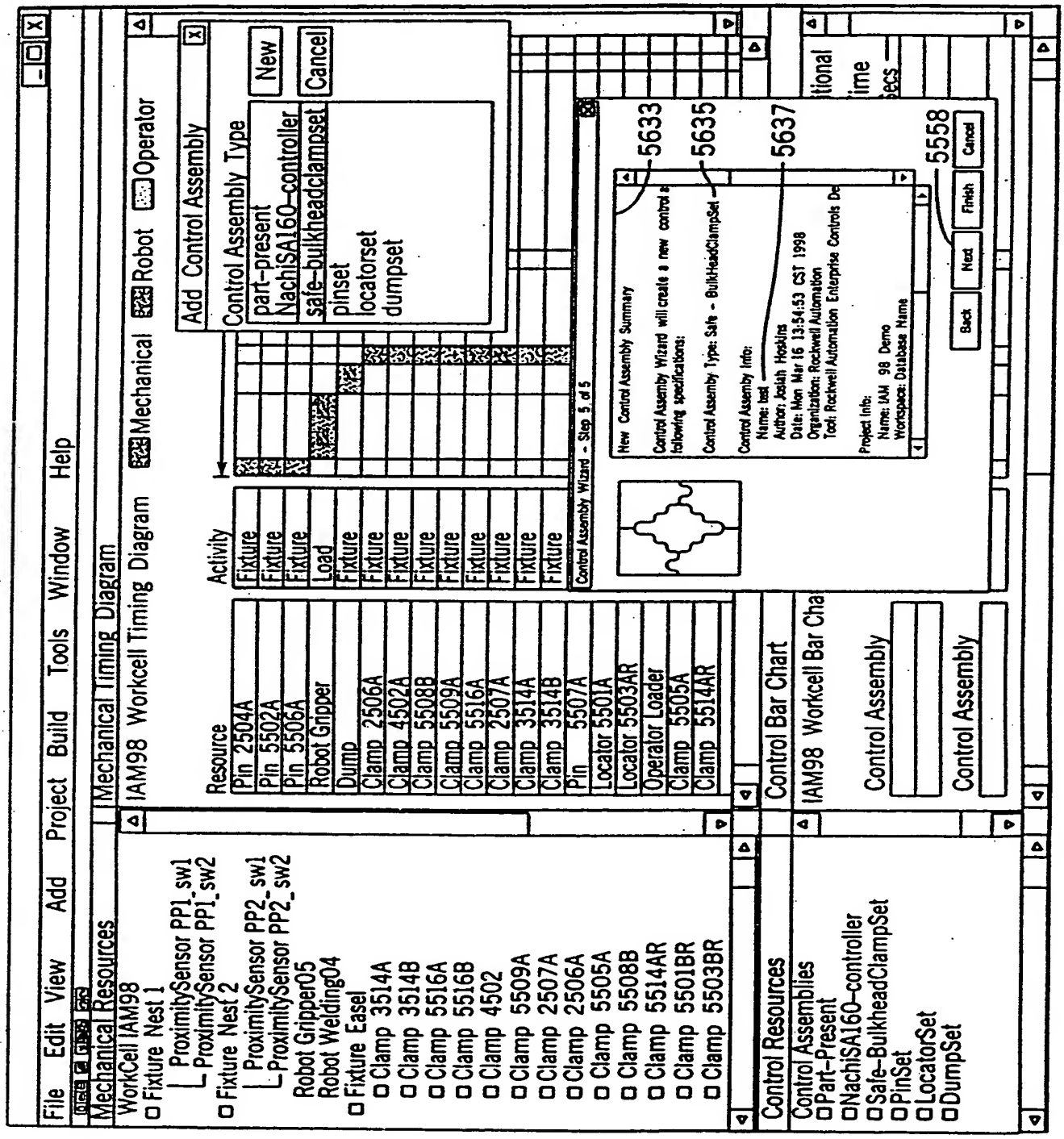

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Assembly Wizard - Step 5 of 5
New Control Assembly Summary
Control Assembly Wizard will create a new control a
following specifications:
Control Assembly Type: Safe - BulkHeadClampSet
Control Assembly Info:
Name: test
Author: Josiah Hoskins
Date: Mon Mar 16 13:54:53 CST 1998
Organization: Rockwell Automation
Tool: Rockwell Automation Enterprise Controls De
Project Info:
Name: IAM 98 Demo
Workspace: Database Name
Back
Next
Finish
Cancel
5633
5635
5637
5558
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
PinSet
LocatorSet
DumpSet
Control Bar Chart
IAM98 Workcell Bar Cha
Control Assembly
Control Assembly

FIG. 68

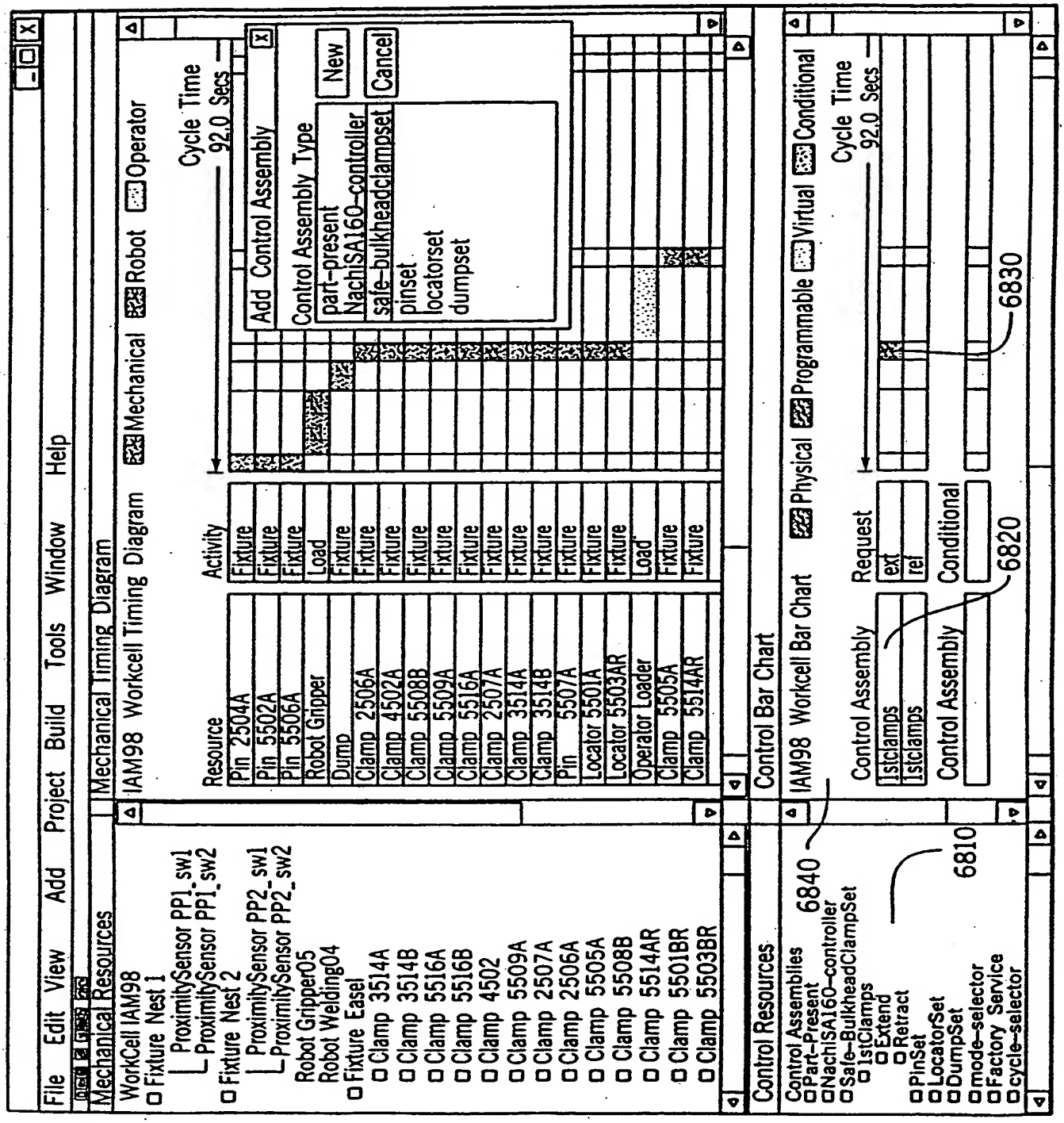

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Fixture
Load
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Control Bar Chart
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
1stClamps
Extend
Retract
PinSet
LocatorSet
DumpSet
mode-selector
Factory Service
cycle-selector
6840
6810
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Control Assembly
Request
ext
ret
Conditional
Control Assembly
6820
Cycle Time
92.0 Secs
6830

FIG. 69

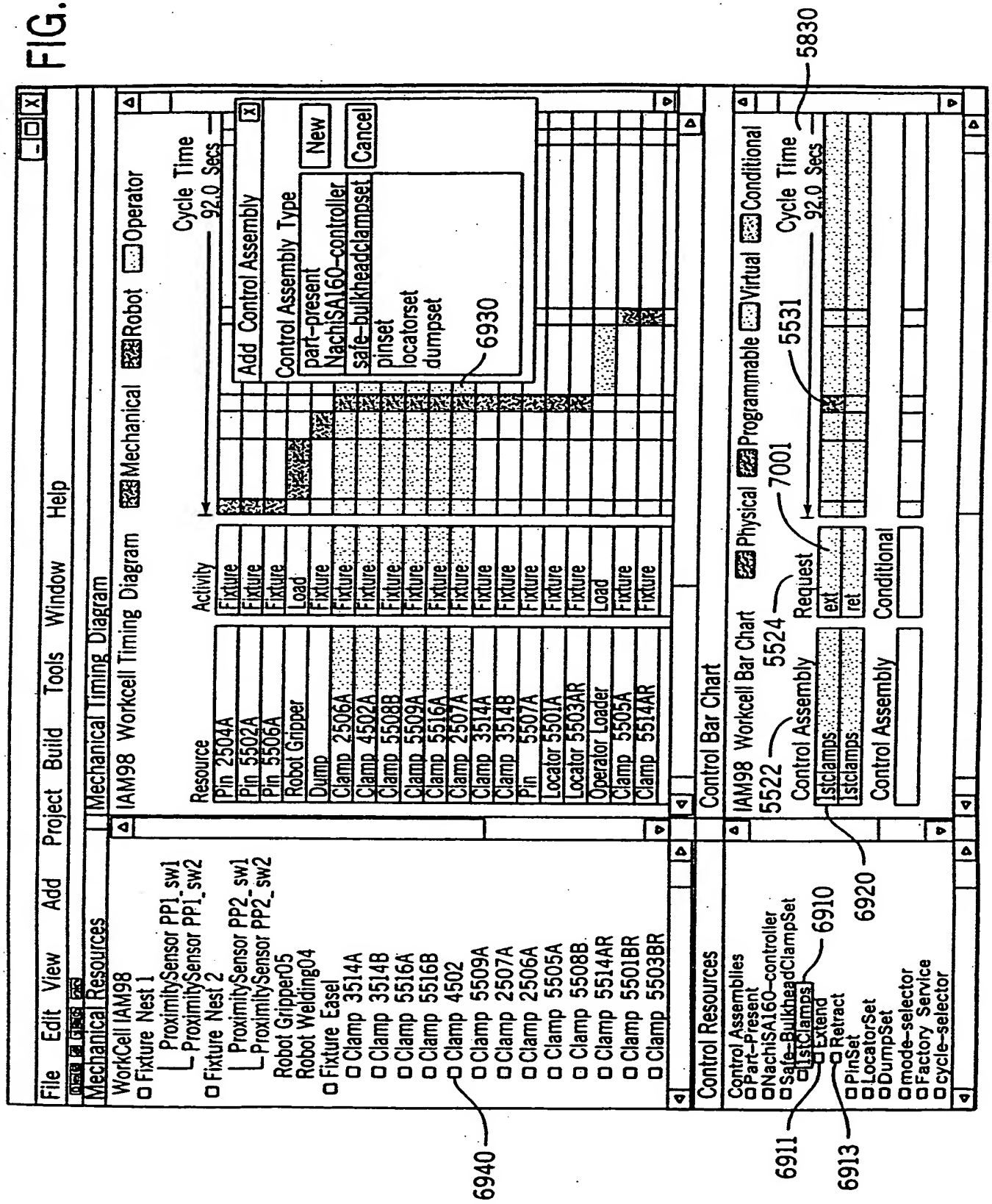

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_sw1
ProximitySensor PP1_sw2
Fixture Nest 2
ProximitySensor PP2_sw1
ProximitySensor PP2_sw2
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 5503BR
6940
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Activity
Resource
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
6930
New
Cancel
Control Bar Chart
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
1stClamps
Extend
Retract
PinSet
LocatorSet
DumpSet
mode-selector
Factory Service
cycle-selector
6911
6910
6913
6920
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
5522
Control Assembly
5524
Request
7001
ext
ret
Conditional
Control Assembly
5531
Cycle Time
92.0 Secs
5830

FIG. 70

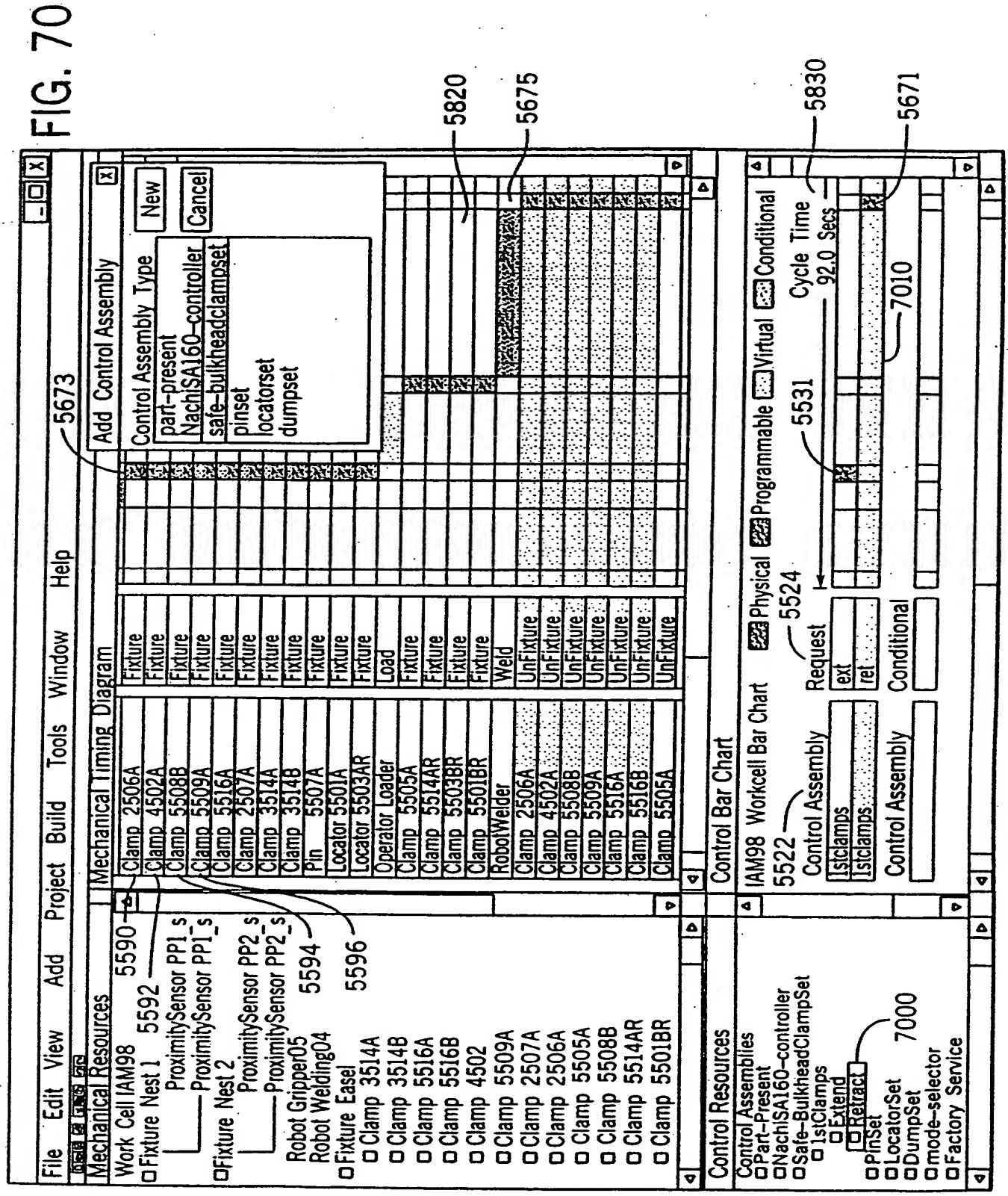

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Work Cell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
5590
5592
5594
5596
Mechanical Timing Diagram
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 2507A
Clamp 3514A
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Clamp 5503BR
Clamp 5501BR
RobotWelder
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Clamp 5505A
Fixture
Load
Weld
UnFixture
5673
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
5820
5675
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
5830
5524
5531
5522
Control Assembly
1stclamps
Request
ext
rel
Conditional
7010
5671
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
1stClamps
Extend
Retract
PinSet
LocatorSet
DumpSet
mode-selector
Factory Service
7000

FIG. 71

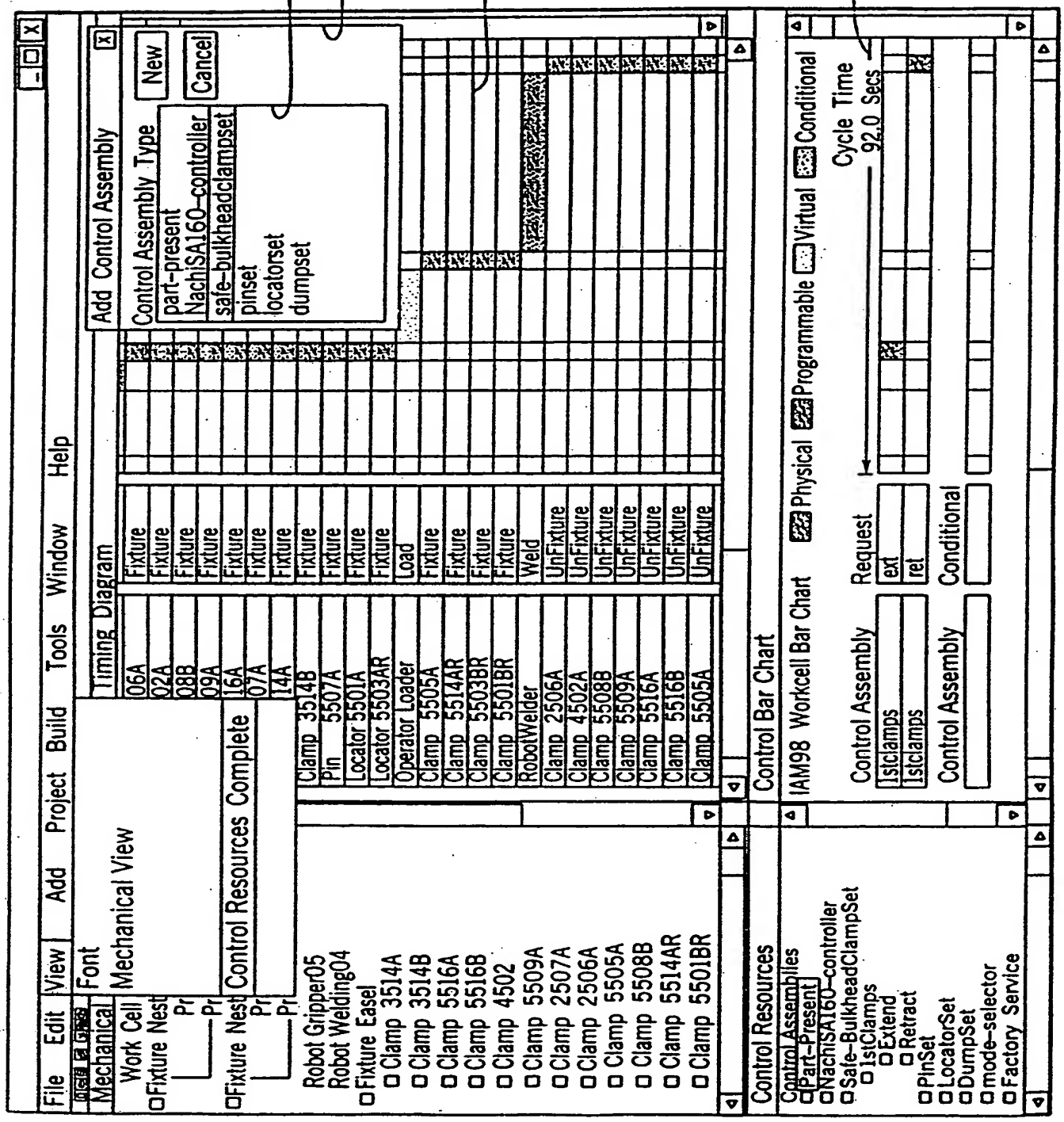

5548
5546
5820
5830
File Edit View Add Project Build Tools Window Help
Mechanical
Work Cell
Mechanical View
Font
Fixture Nest
Fixture Nest
Control Resources Complete
Timing Diagram
Add Control Assembly
Control Assembly Type
part-present
NachiSA160-controller
safe-bulkheadclampset
pinset
locatorset
dumpset
New
Cancel
Robot Gripper05
Robot Welding04
Fixture Easel
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Clamp 5509A
Clamp 2507A
Clamp 2506A
Clamp 5505A
Clamp 5508B
Clamp 5514AR
Clamp 5501BR
Clamp 3514B
Pin 5507A
Locator 5501A
Locator 5503AR
Operator Loader
Clamp 5505A
Clamp 5514AR
Clamp 5503BR
Clamp 5501BR
RobotWelder
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Clamp 5505A
Fixture
Load
Weld
UnFixture
Control Bar Chart
Control Resources
Control Assemblies
Part-Present
NachiSA160-controller
Safe-BulkheadClampSet
1stClamps
Extend
Retract
PinSet
LocatorSet
DumpSet
mode-selector
Factory Service
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
Control Assembly
Request
1stclamps
ext
ret
Control Assembly
Conditional

FIG. 72

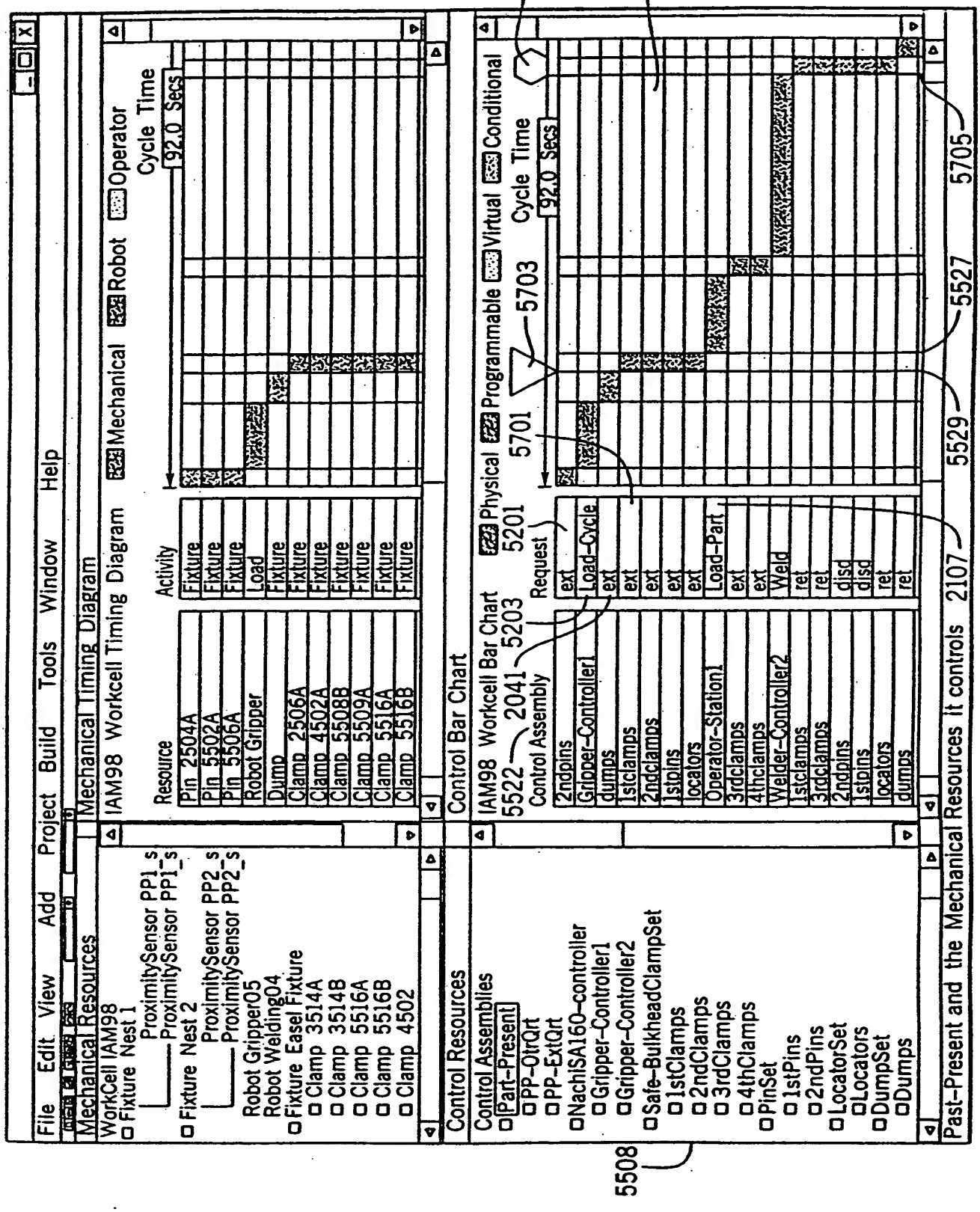

File Edit View Add Project Build Tools Window Help
Mechanical Timing Diagram
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Fixture
Load
Control Bar Chart
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
Control Assembly
Request
2ndpins
Gripper-Controller1
dumps
1stclamps
2ndclamps
1stpins
locators
Operator-Station1
3rdclamps
4thclamps
Welder-Controller2
ext
Load-Cycle
Load-Part
Weld
ret
disd
5707
5830
5703
5701
5201
5203
2041
5522
5529
5527
5705
2107
Mechanical Resources
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel Fixture
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Control Resources
Control Assemblies
Part-Present
PP-OtrOrt
PP-ExtOrt
NachiSA160-controller
Gripper-Controller1
Gripper-Controller2
Safe-BulkheadClampSet
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
5508
Past-Present and the Mechanical Resources it controls

FIG. 73

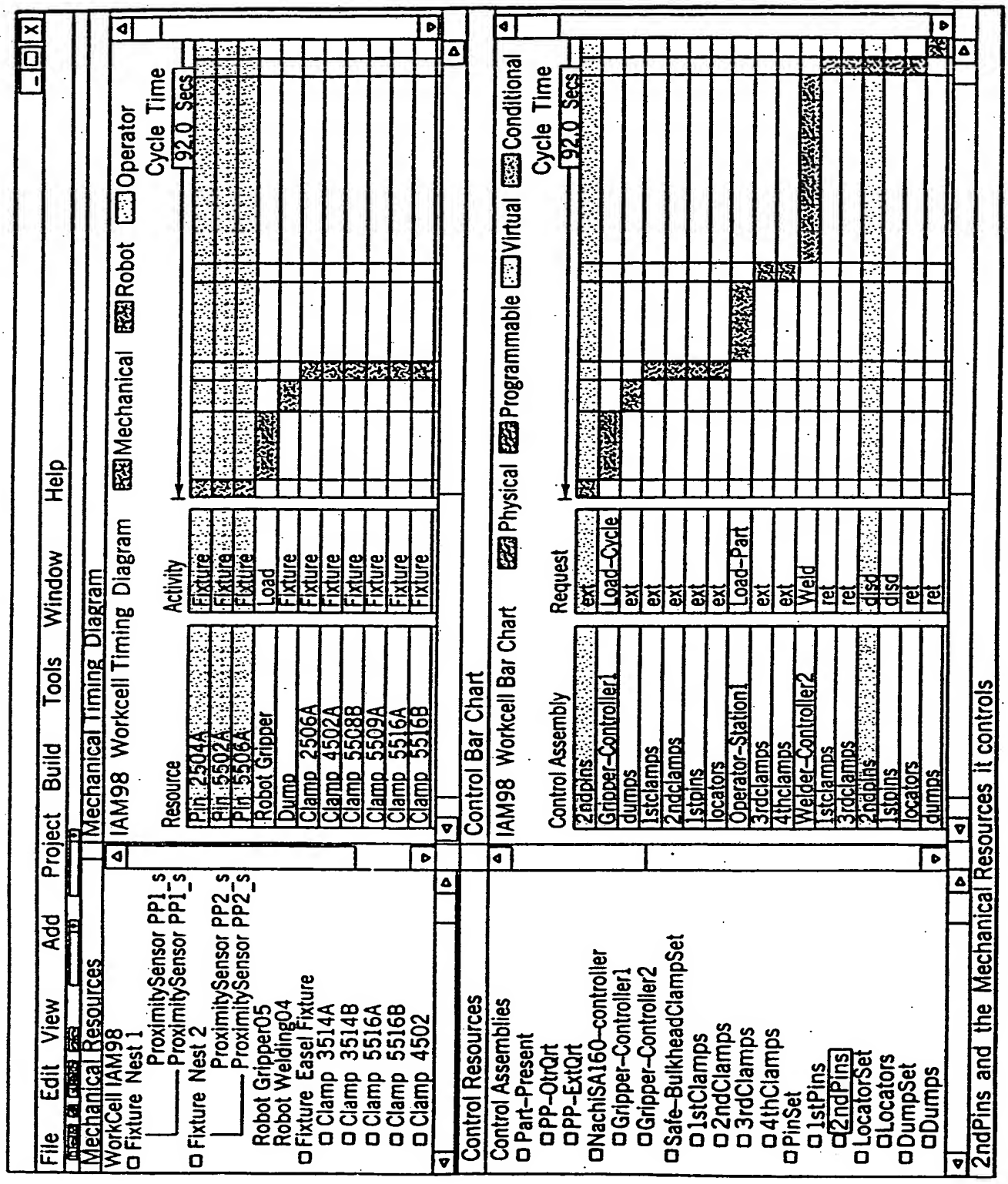

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel Fixture
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Fixture
Load
Control Bar Chart
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-controller
Gripper-Controller1
Gripper-Controller2
Safe-BulkheadClampSet
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
Control Assembly
Request
2ndpins
Gripper-Controller1
dumps
1stclamps
2ndclamps
1stpins
locators
Operator-Station1
3rdclamps
4thclamps
Welder-Controller2
1stclamps
3rdclamps
2ndpins
1stpins
locators
dumps
ext
Load-Cycle
Load-Part
Weld
ret
disd
2ndPins and the Mechanical Resources it controls

FIG. 74

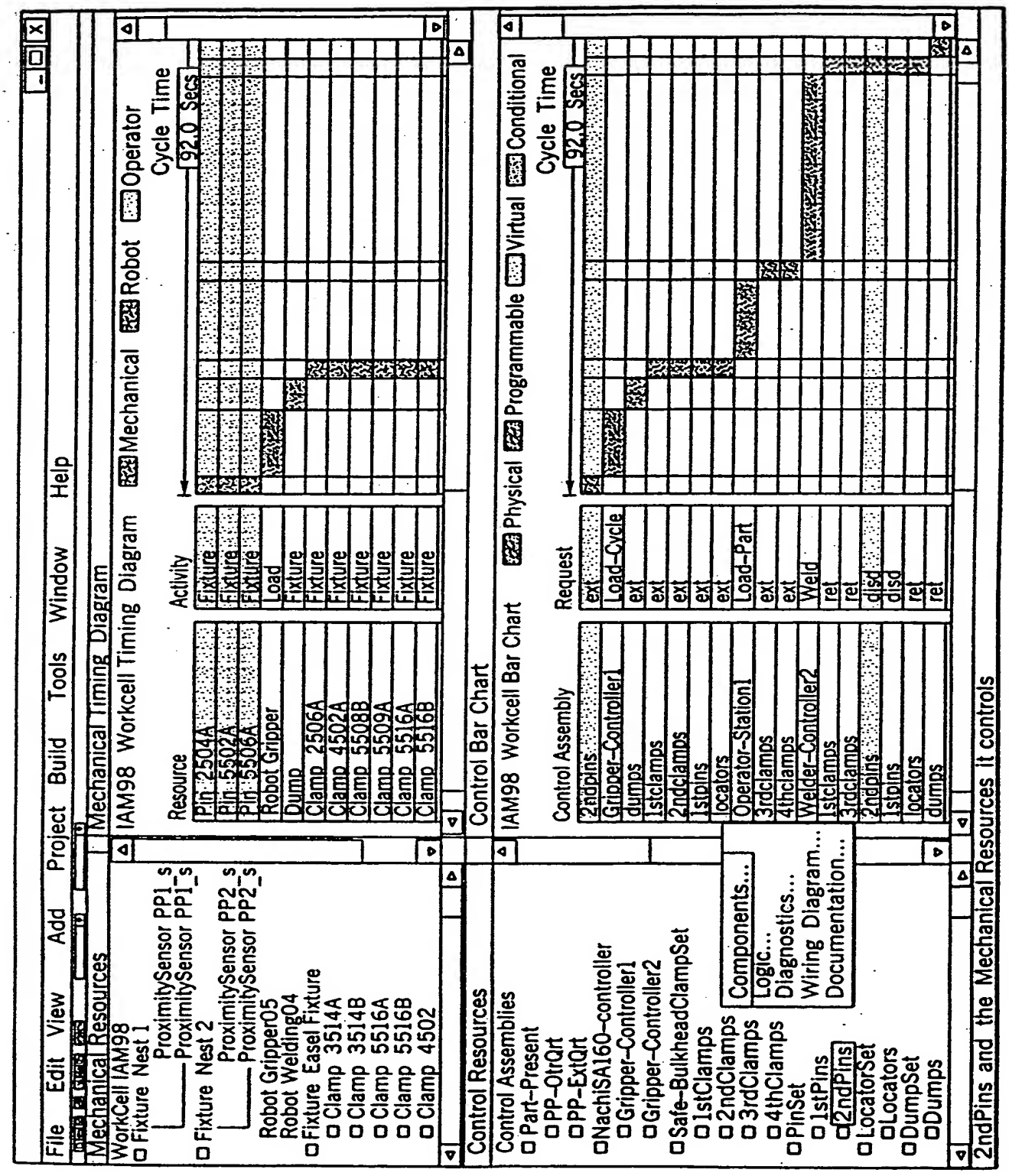

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel Fixture
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Resource
Activity
Cycle Time
92.0 Secs
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Fixture
Load
Control Bar Chart
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-controller
Gripper-Controller1
Gripper-Controller2
Safe-BulkheadClampSet
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
Components...
Logic...
Diagnostics...
Wiring Diagram...
Documentation...
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Control Assembly
Request
Cycle Time
92.0 Secs
2ndPins
Gripper-Controller1
dumps
1stclamps
2ndclamps
1stpins
locators
Operator-Station1
3rdclamps
4thclamps
Welder-Controller2
1stclamps
3rdclamps
2ndpins
1stpins
locators
dumps
ext
Load-Cycle
Load-Part
Weld
rel
disd
2ndPins and the Mechanical Resources it controls

FIG. 75

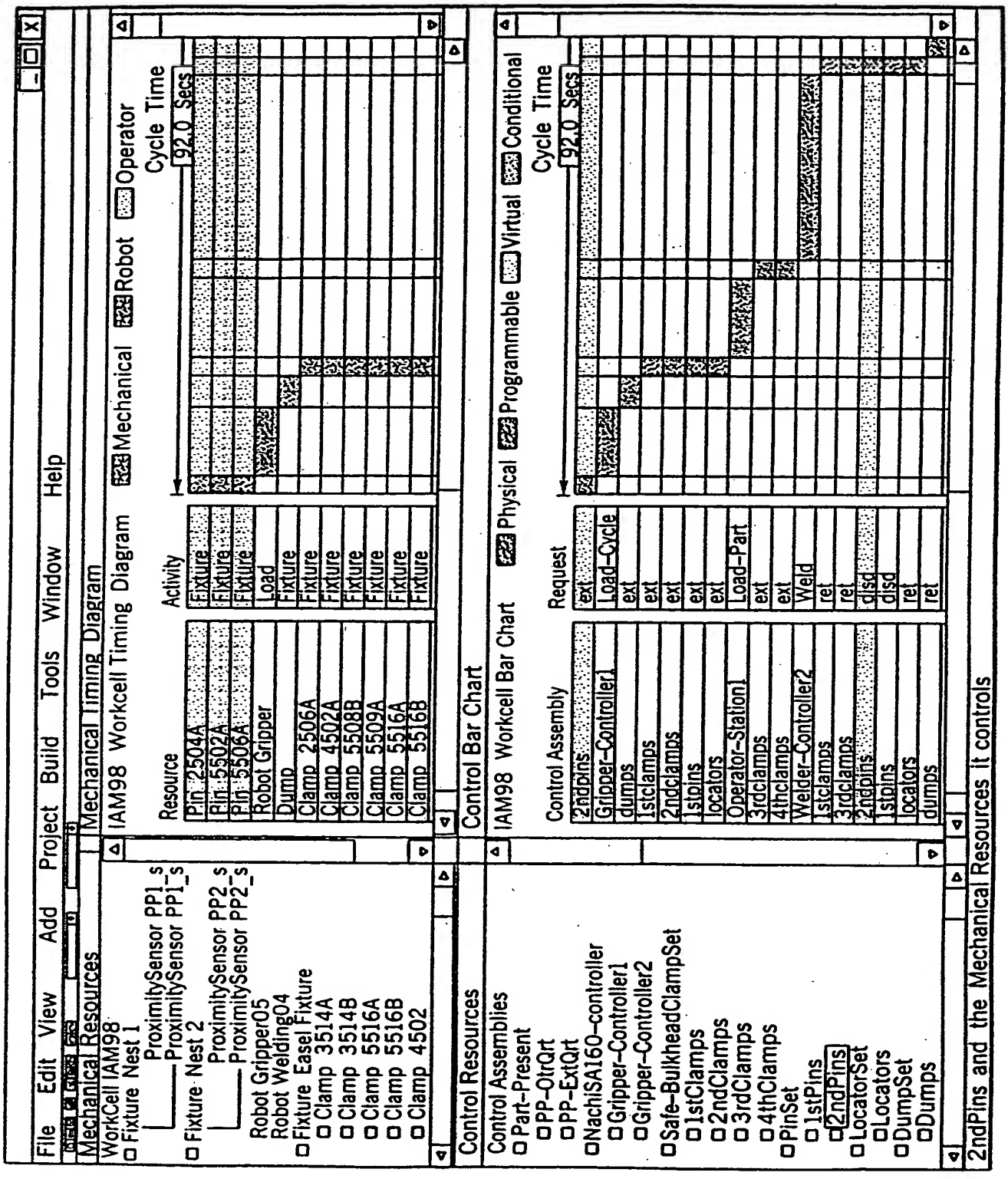

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel Fixture
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Fixture
Load
Control Bar Chart
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-controller
Gripper-Controller1
Gripper-Controller2
Safe-BulkheadClampSet
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
Control Assembly
Request
2ndpins
Load-Cycle
Load-Part
Weld
ext
ret
dlsd
Gripper-Controller1
dumps
1stclamps
2ndclamps
1stpins
locators
Operator-Station1
3rdclamps
4thclamps
Welder-Controller2
2ndPins and the Mechanical Resources it controls

FIG. 76

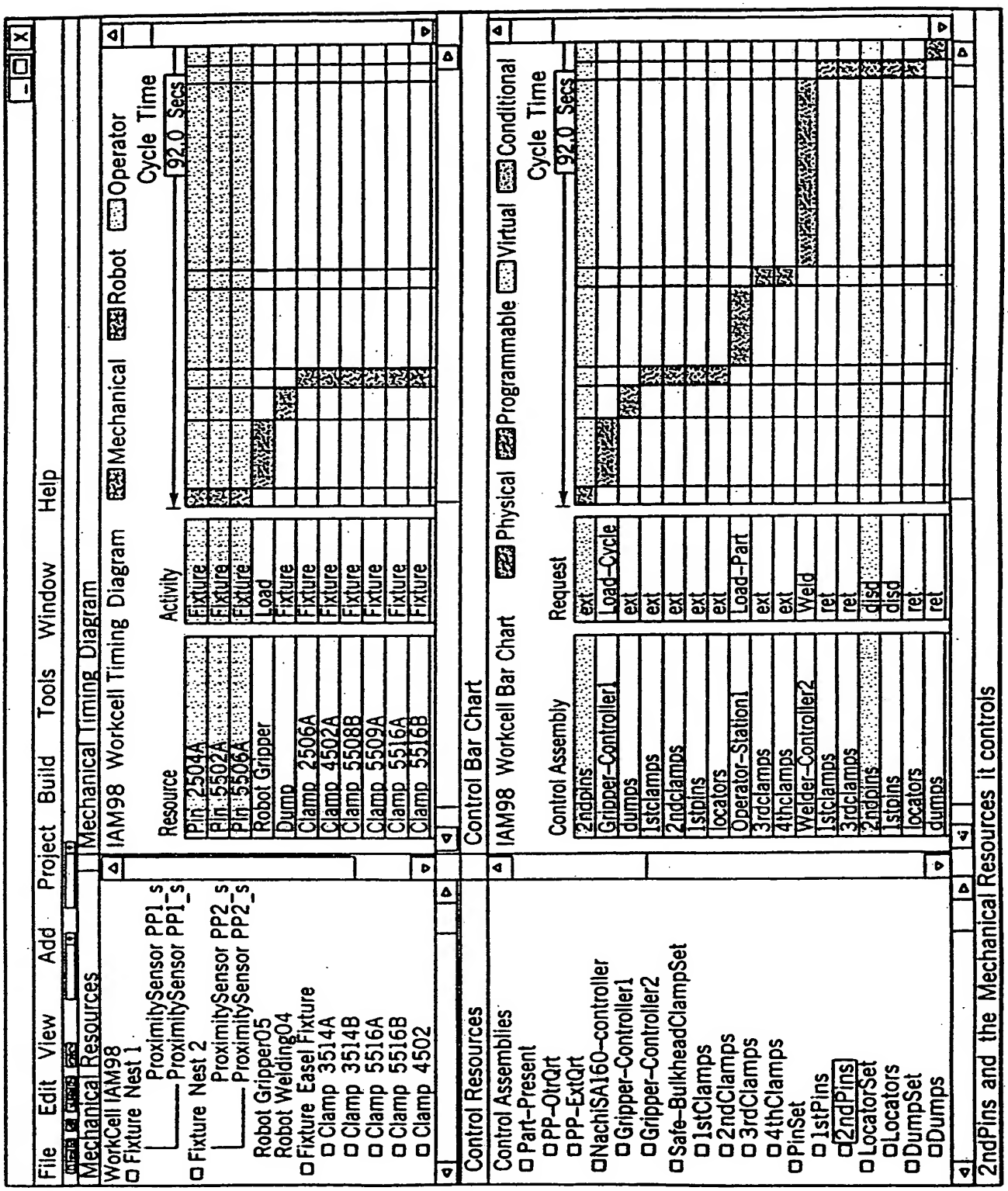

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IAM98
Fixture Nest 1
ProximitySensor PP1_s
ProximitySensor PP1_s
Fixture Nest 2
ProximitySensor PP2_s
ProximitySensor PP2_s
Robot Gripper05
Robot Welding04
Fixture Easel Fixture
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
IAM98 Workcell Timing Diagram
Mechanical
Robot
Operator
Cycle Time
92.0 Secs
Resource
Activity
Pin 2504A
Pin 5502A
Pin 5506A
Robot Gripper
Dump
Clamp 2506A
Clamp 4502A
Clamp 5508B
Clamp 5509A
Clamp 5516A
Clamp 5516B
Fixture
Load
Control Bar Chart
Control Resources
Control Assemblies
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-controller
Gripper-Controller1
Gripper-Controller2
Safe-BulkheadClampSet
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
IAM98 Workcell Bar Chart
Physical
Programmable
Virtual
Conditional
Cycle Time
92.0 Secs
Control Assembly
Request
2ndpins
Gripper-Controller1
dumps
1stclamps
2ndclamps
1stpins
locators
Operator-Station1
3rdclamps
4thclamps
Welder-Controller2
1stclamps
3rdclamps
2ndpins
1stpins
locators
dumps
ext
Load-Cycle
Load-Part
Weld
ret
disd
2ndPins and the Mechanical Resources it controls

FIG. 77

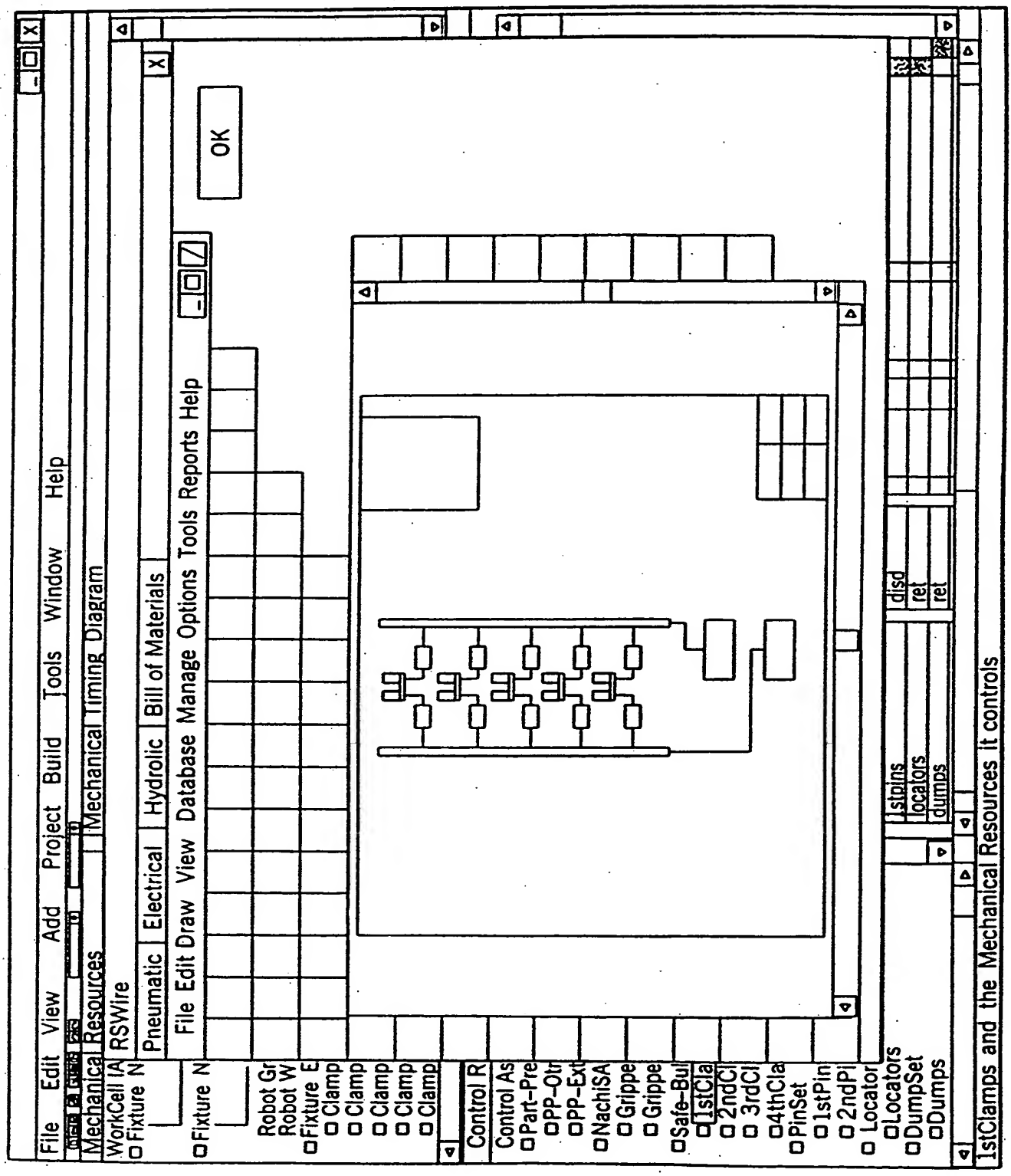

File Edit View Add Project Build Tools Window Help
Mechanical Resources
Mechanical Timing Diagram
WorkCell IA RSWire
Fixture N
Pneumatic
Electrical
Hydrolic
Bill of Materials
File Edit Draw View Database Manage Options Tools Reports Help
OK
Fixture N
Robot Gr
Robot W
Fixture E
Clamp
Clamp
Clamp
Clamp
Clamp
Control R
Control As
Part-Pre
PP-Otr
PP-Ext
NachiSA
Grippe
Grippe
Safe-Bui
1stCla
2ndCl
3rdCl
4thCla
PinSet
1stPin
2ndPi
Locator
Locators
DumpSet
Dumps
disd
ret
ret
1stpins
locators
dumps
1stClamps and the Mechanical Resources it controls

FIG. 78

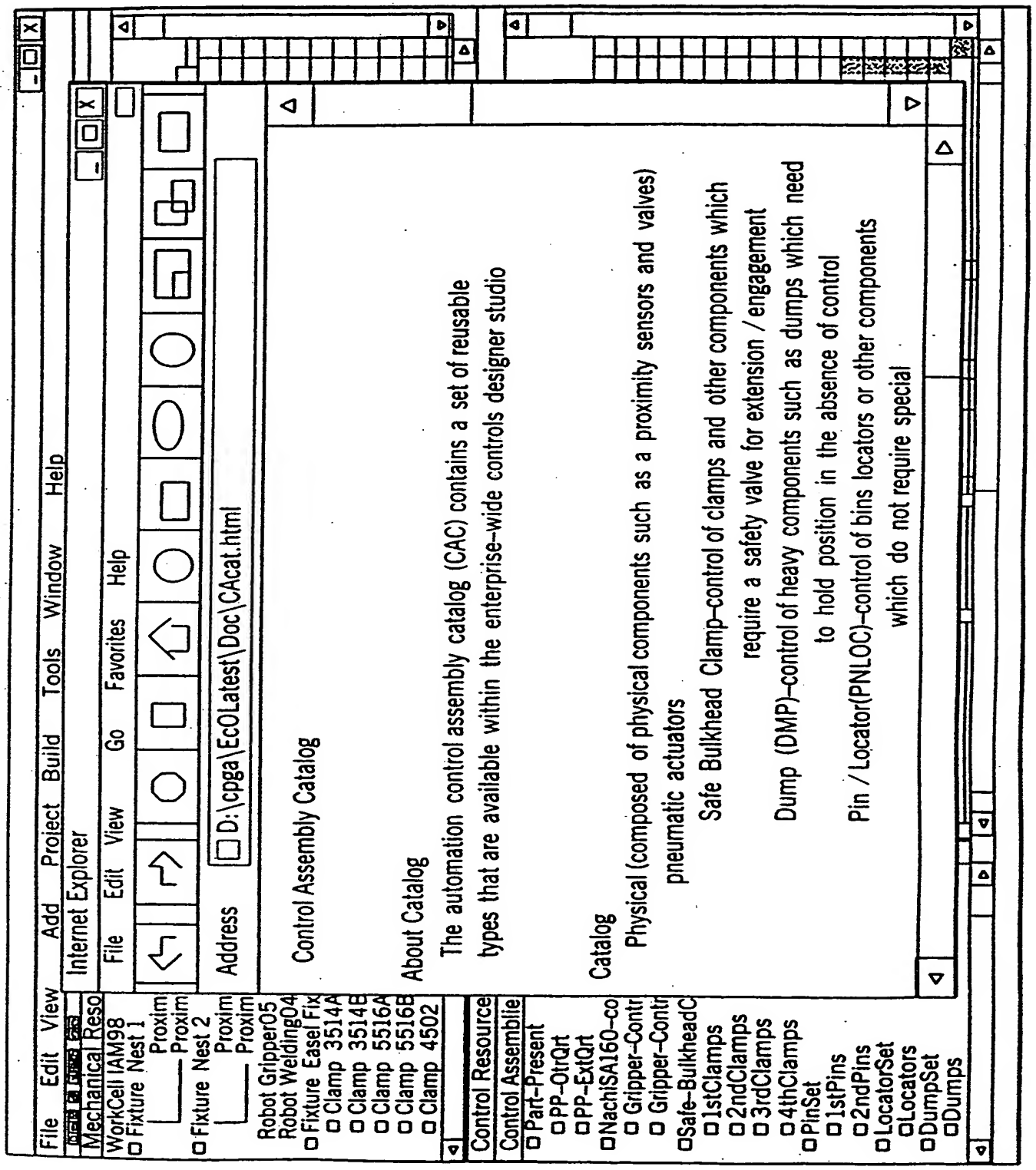
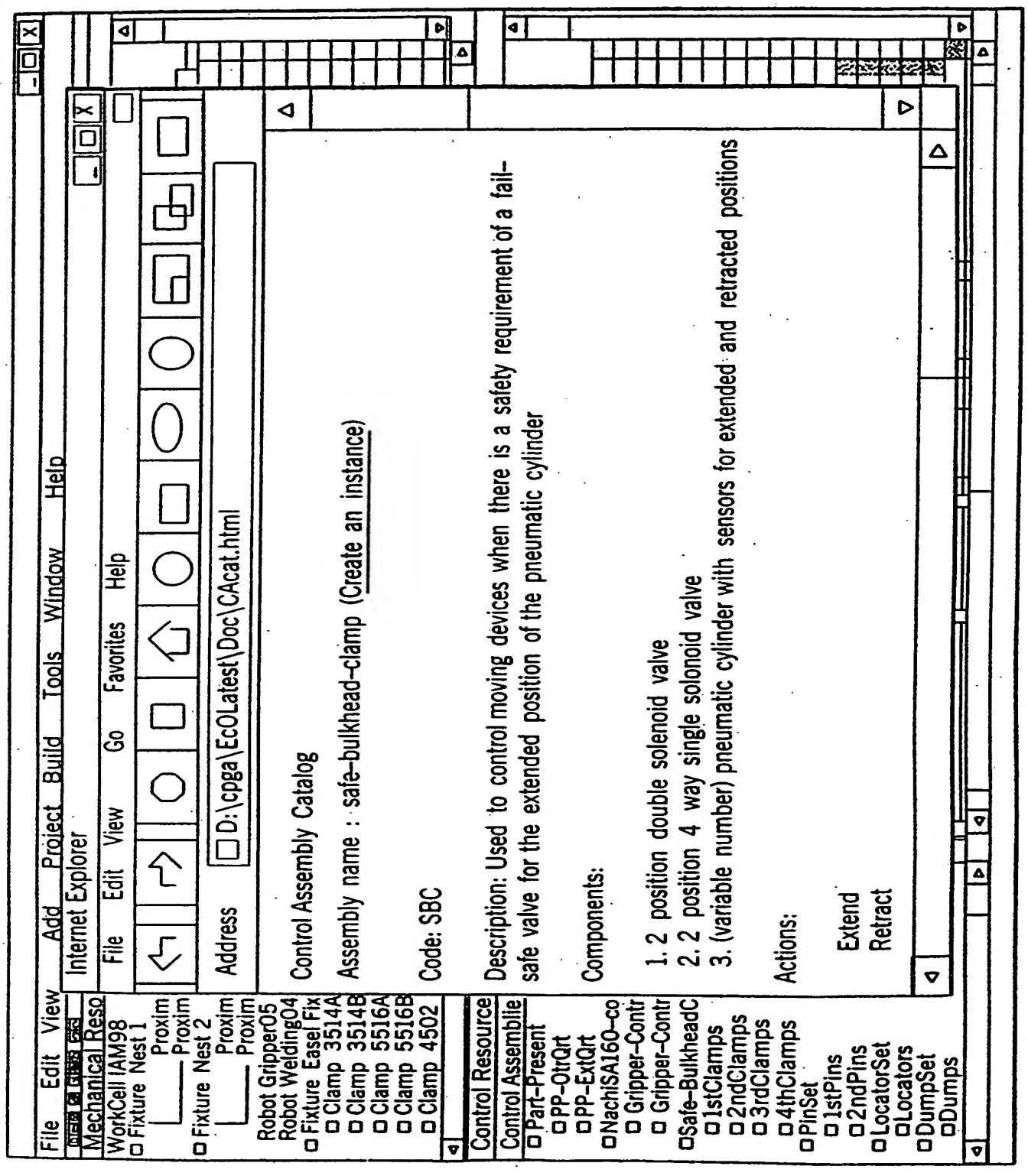

File Edit View Add Project Build Tools Window Help
Internet Explorer
File Edit View Go Favorites Help
Address D:\cpga\EcOLatest\Doc\CAcat.html
Control Assembly Catalog
About Catalog
The automation control assembly catalog (CAC) contains a set of reusable types that are available within the enterprise-wide controls designer studio
Catalog
Physical (composed of physical components such as a proximity sensors and valves)
pneumatic actuators
Safe Bulkhead Clamp–control of clamps and other components which require a safety valve for extension / engagement
Dump (DMP)–control of heavy components such as dumps which need to hold position in the absence of control
Pin / Locator(PNLOC)–control of bins locators or other components which do not require special
Mechanical Reso
WorkCell IAM98
Fixture Nest 1
Proxim
Proxim
Fixture Nest 2
Proxim
Proxim
Robot Gripper05
Robot Welding04
Fixture Easel Fix
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Control Resource
Control Assemblie
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-co
Gripper-Contr
Gripper-Contr
Safe-BulkheadC
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps

FIG. 79


File Edit View Add Project Build Tools Window Help
Mechanical Reso
WorkCell IAM98
Fixture Nest 1
Proxim
Proxim
Fixture Nest 2
Proxim
Proxim
Robot Gripper05
Robot Welding04
Fixture Easel Fix
Clamp 3514A
Clamp 3514B
Clamp 5516A
Clamp 5516B
Clamp 4502
Control Resource
Control Assemblie
Part-Present
PP-OtrQrt
PP-ExtQrt
NachiSA160-co
Gripper-Contr
Gripper-Contr
Safe-BulkheadC
1stClamps
2ndClamps
3rdClamps
4thClamps
PinSet
1stPins
2ndPins
LocatorSet
Locators
DumpSet
Dumps
Internet Explorer
File Edit View Go Favorites Help
Address D:\cpga\EcOLatest\Doc\CAcat.html
Control Assembly Catalog
Assembly name : safe-bulkhead-clamp (Create an instance)
Code: SBC
Description: Used to control moving devices when there is a safety requirement of a fail-safe valve for the extended position of the pneumatic cylinder
Components:
1. 2 position double solenoid valve
2. 2 position 4 way single solenoid valve
3. (variable number) pneumatic cylinder with sensors for extended and retracted positions
Actions:
Extend
Retract

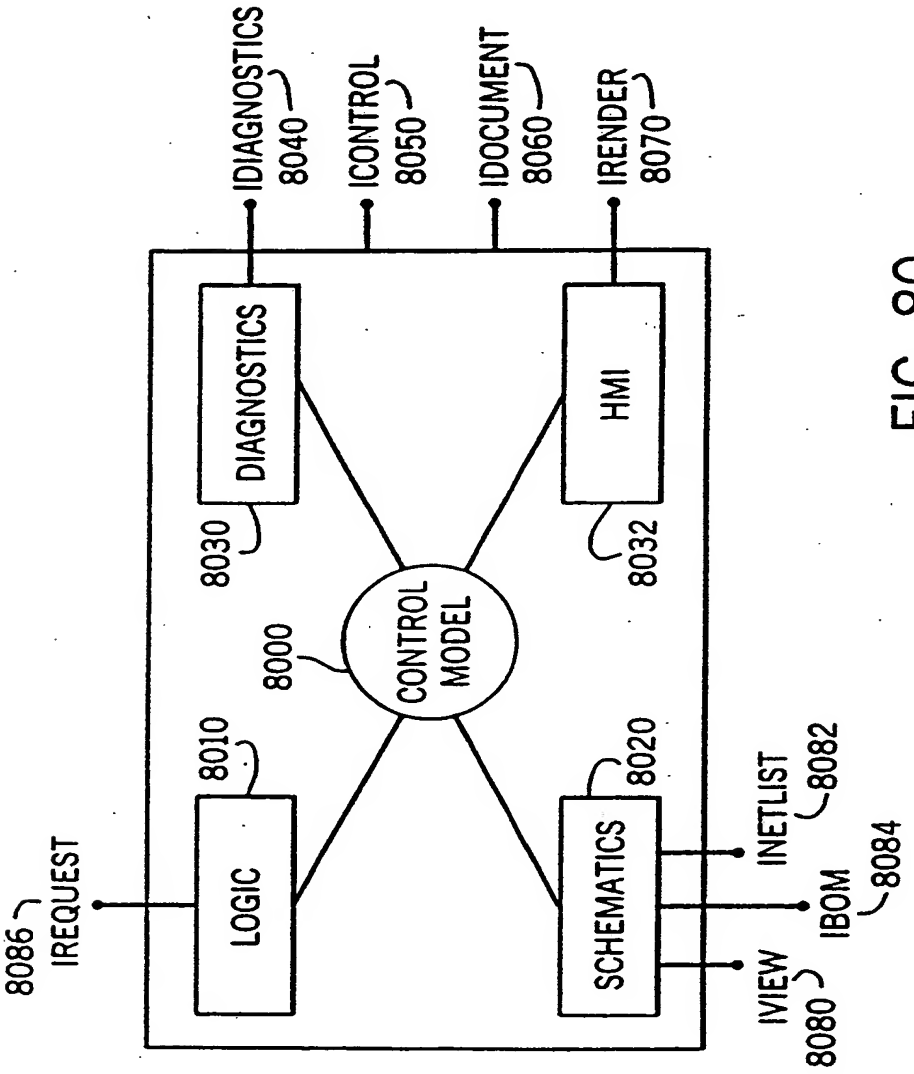

IDIAGNOSTICS
8040
ICONTROL
8050
IDOCUMENT
8060
IRENDER
8070
DIAGNOSTICS
HMI
8030
8032
8000
CONTROL MODEL
8010
8020
LOGIC
SCHEMATICS
INETLIST
8082
IBOM
8084
IVIEW
8080
IREQUEST
8086

FIG. 80

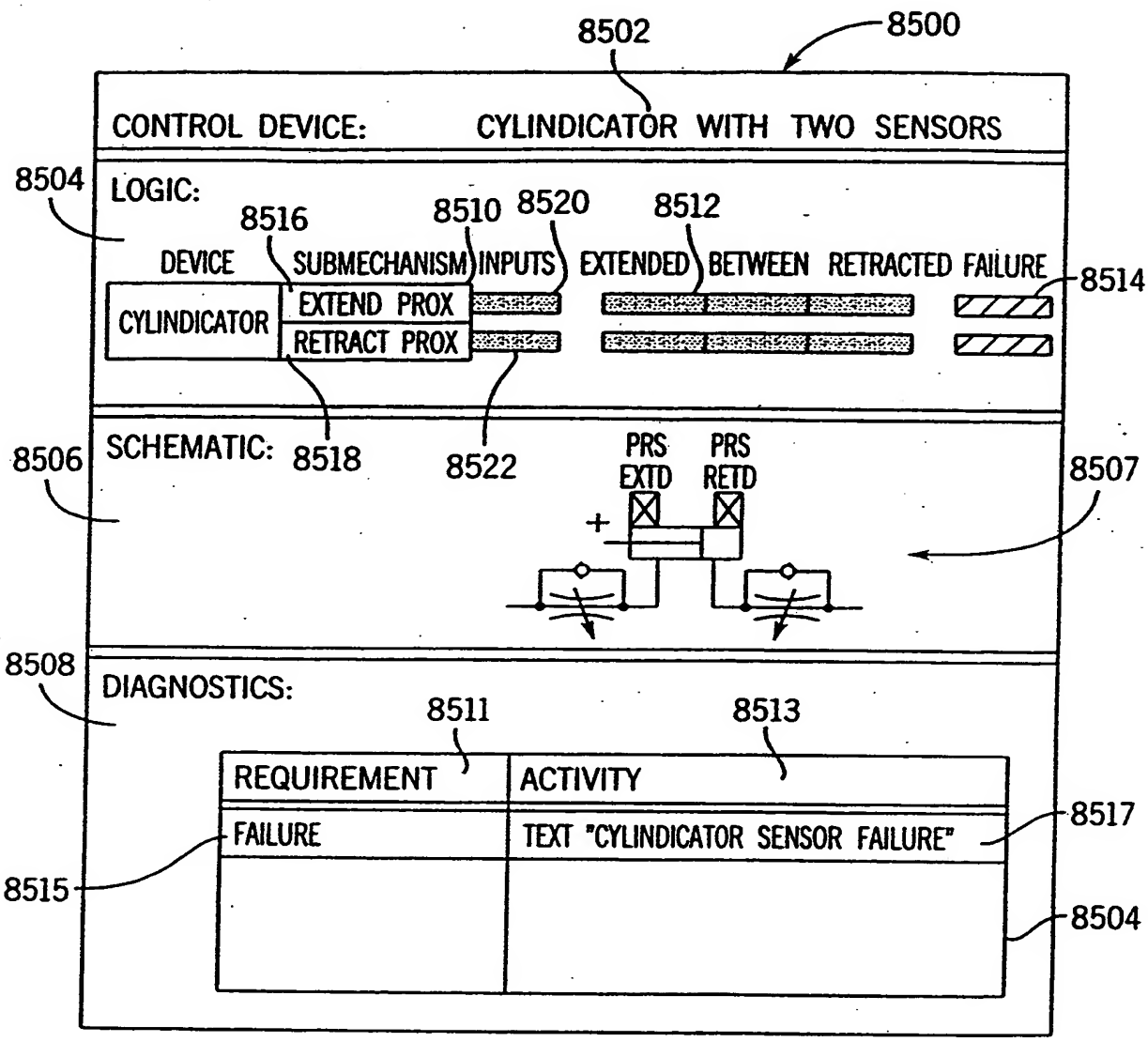

8502
8500
CONTROL DEVICE: CYLINDICATOR WITH TWO SENSORS
8504
LOGIC:
8516
8510
8520
8512
DEVICE
SUBMECHANISM
INPUTS
EXTENDED
BETWEEN
RETRACTED
FAILURE
8514
CYLINDICATOR
EXTEND PROX
RETRACT PROX
8506
SCHEMATIC:
8518
8522
PRS EXTD
PRS RETD
8507
8508
DIAGNOSTICS:
8511
8513
REQUIREMENT
ACTIVITY
FAILURE
TEXT "CYLINDICATOR SENSOR FAILURE"
8517
8515
8504

FIG. 81

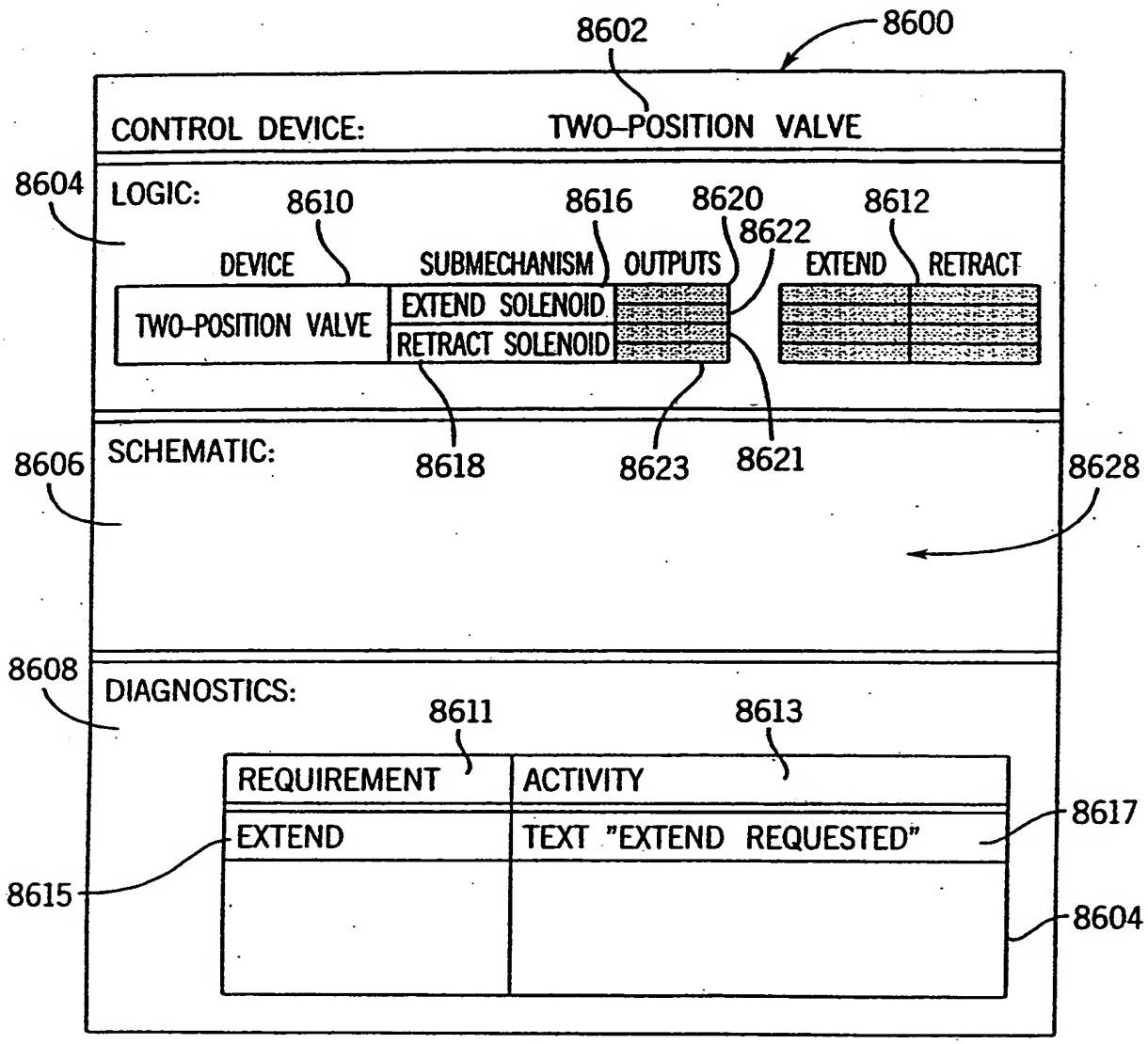

8602
8600
CONTROL DEVICE:
TWO-POSITION VALVE
8604
LOGIC:
8610
8616
8620
8622
8612
DEVICE
SUBMECHANISM
OUTPUTS
EXTEND
RETRACT
TWO-POSITION VALVE
EXTEND SOLENOID
RETRACT SOLENOID
8606
SCHEMATIC:
8618
8623
8621
8628
8608
DIAGNOSTICS:
8611
8613
REQUIREMENT
ACTIVITY
EXTEND
TEXT "EXTEND REQUESTED"
8617
8615
8604

FIG. 82

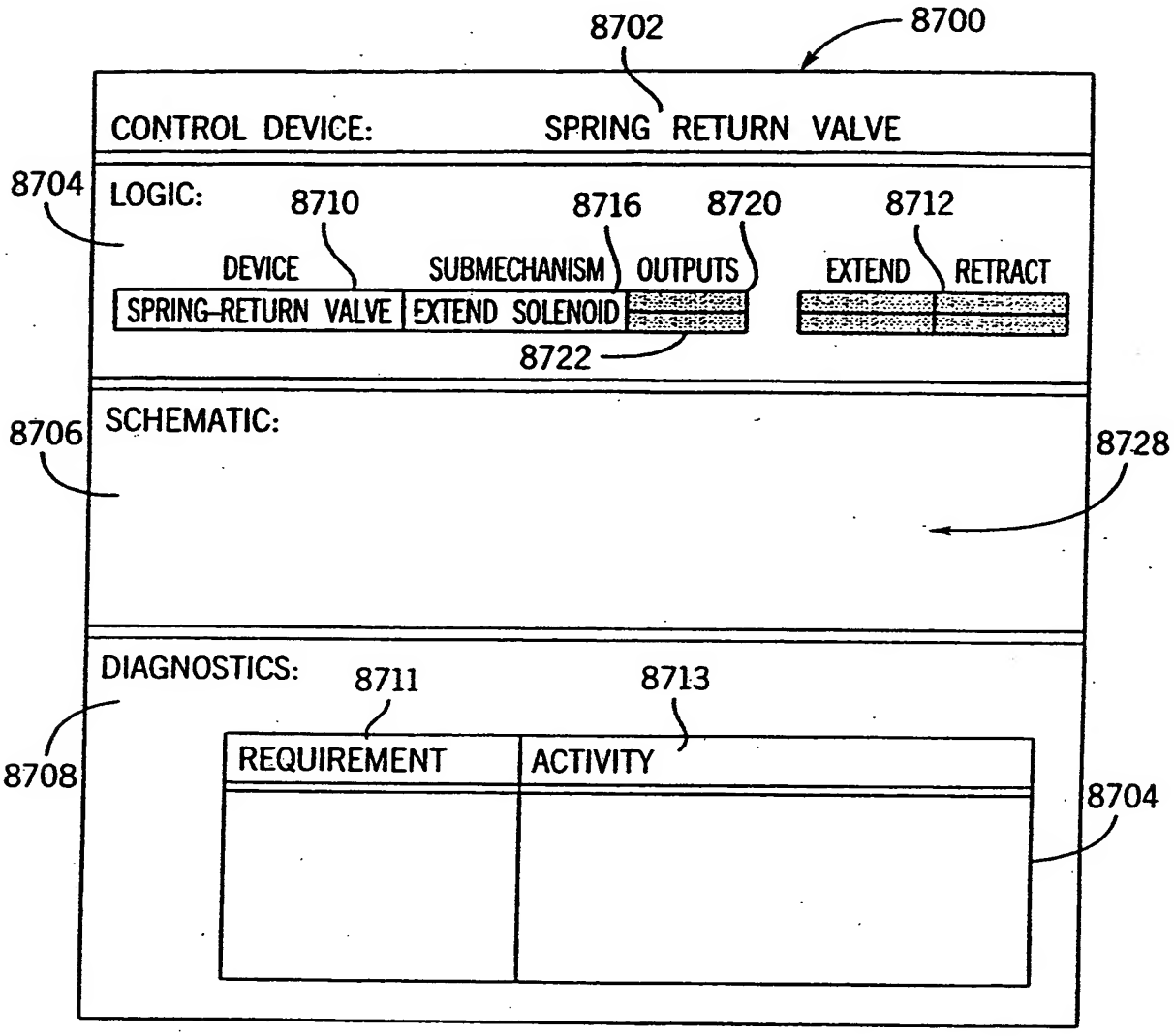

8702
8700
CONTROL DEVICE:
SPRING RETURN VALVE
8704
LOGIC:
8710
8716
8720
8712
DEVICE
SUBMECHANISM
OUTPUTS
EXTEND
RETRACT
SPRING-RETURN VALVE
EXTEND SOLENOID
8722
8706
SCHEMATIC:
8728
DIAGNOSTICS:
8711
8713
8708
REQUIREMENT
ACTIVITY
8704

FIG. 83

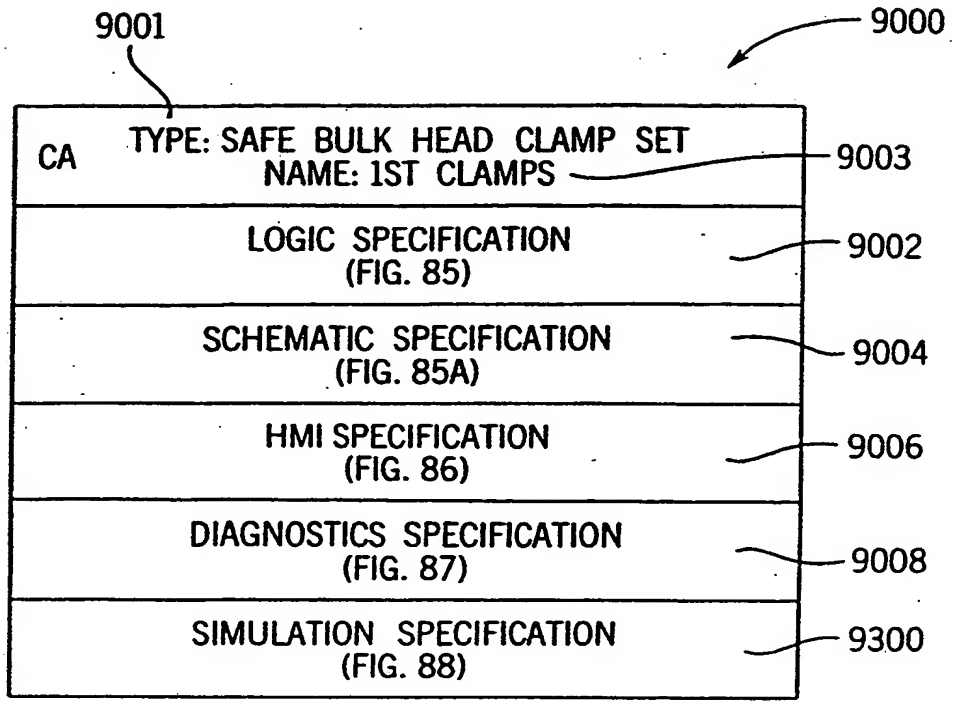


FIG. 84

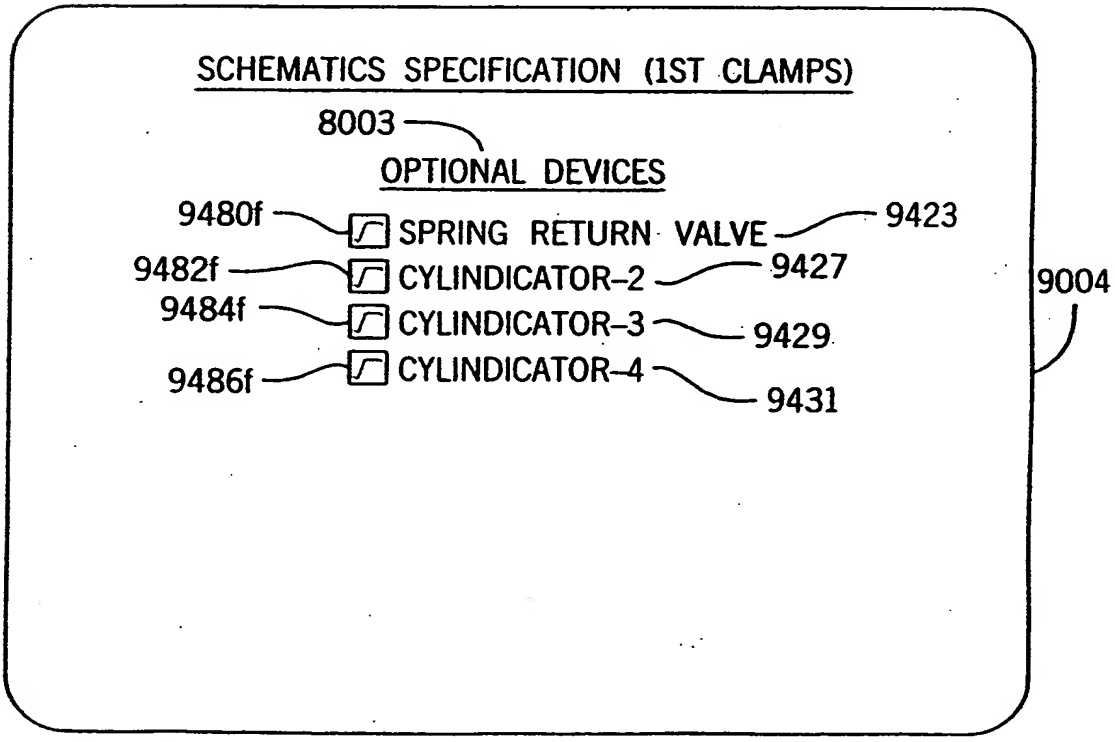


FIG. 85A

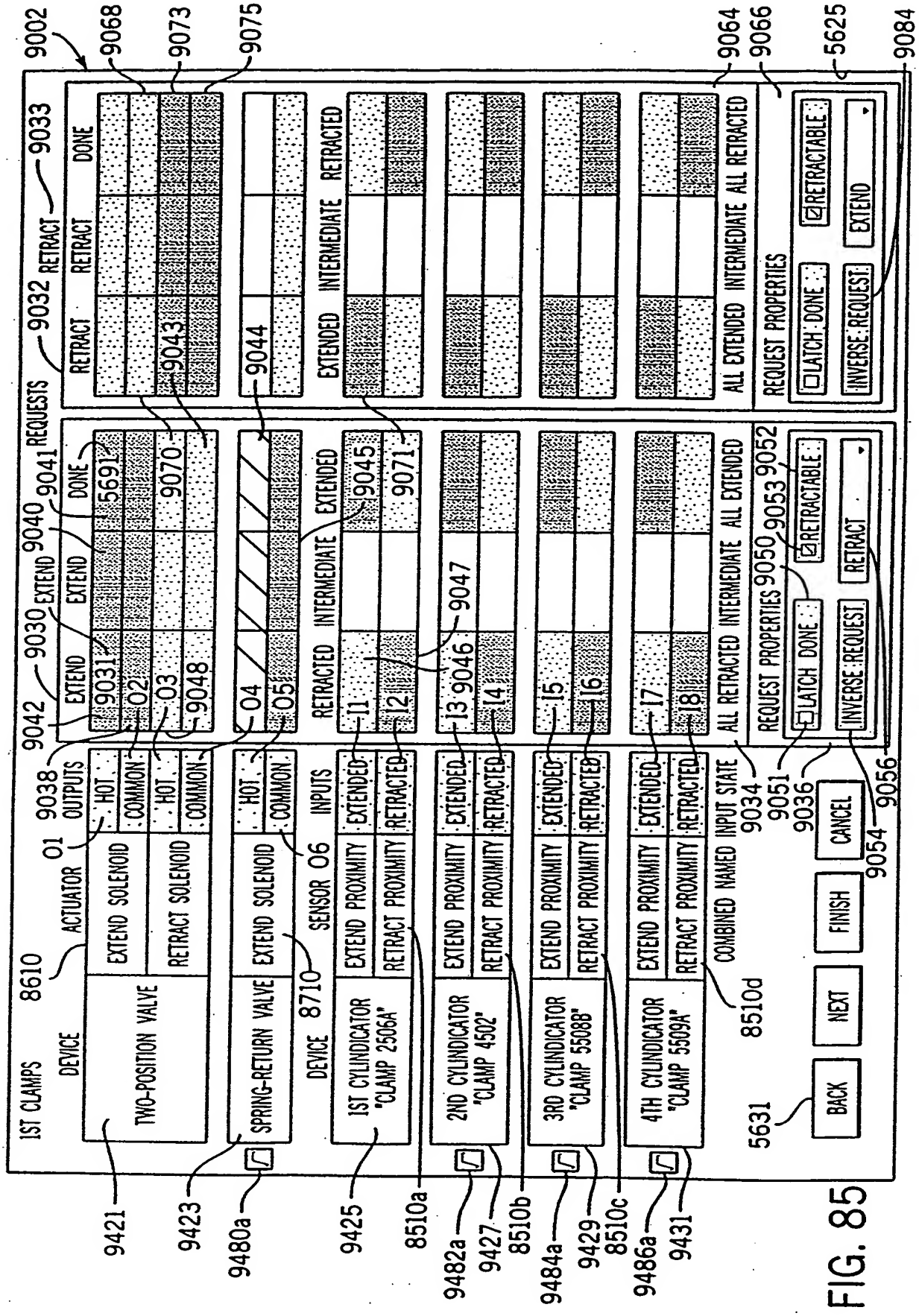

9002
9068
9073
9075
9064
9066
5625
9084
9033
9032
RETRACT
RETRACT
RETRACT
DONE
9043
9044
EXTENDED
INTERMEDIATE
RETRACTED
ALL EXTENDED
INTERMEDIATE
ALL RETRACTED
REQUEST PROPERTIES
LATCH DONE
RETRACTABLE
INVERSE REQUEST
EXTEND
1ST CLAMPS
REQUESTS
9041
9040
9030
9042
9038
9052
9053
9050
9051
9036
9034
9054
9056
DEVICE
ACTUATOR
OUTPUTS
INPUTS
01
02
03
04
05
06
11
12
13
14
15
16
17
18
9031
9048
9046
9047
9045
9071
9070
5691
EXTEND
DONE
RETRACTABLE
RETRACT
HOT
COMMON
EXTENDED
RETRACTED
ALL RETRACTED
INTERMEDIATE
ALL EXTENDED
COMBINED NAMED INPUT STATE
8610
TWO-POSITION VALVE
EXTEND SOLENOID
RETRACT SOLENOID
8710
SPRING-RETURN VALVE
EXTEND SOLENOID
SENSOR
1ST CYLINDICATOR "CLAMP 2506A"
2ND CYLINDICATOR "CLAMP 4502"
3RD CYLINDICATOR "CLAMP 5508B"
4TH CYLINDICATOR "CLAMP 5509A"
EXTEND PROXIMITY
RETRACT PROXIMITY
8510d
5631
BACK
NEXT
FINISH
CANCEL
9421
9423
9480a
9425
8510a
9482a
9427
8510b
9484a
9429
8510c
9486a
9431

FIG. 85

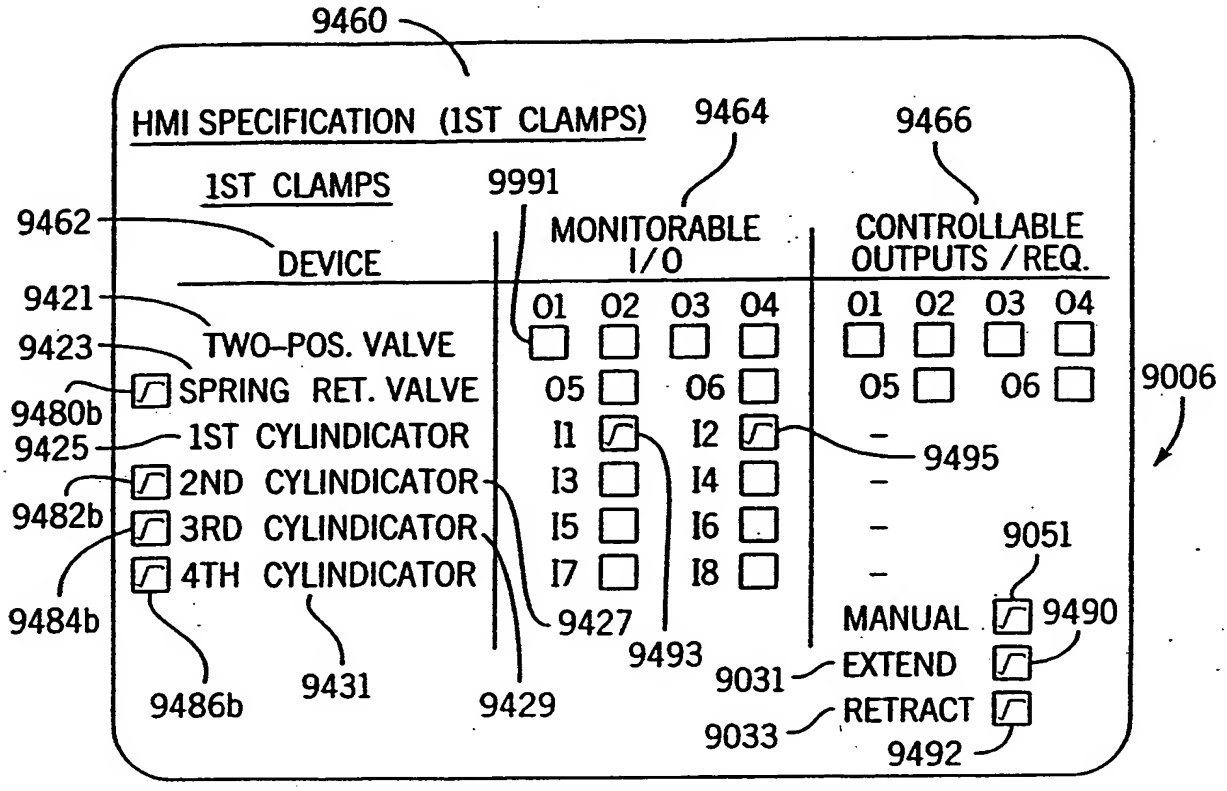

9460
HMI SPECIFICATION (1ST CLAMPS)
9464
9466
1ST CLAMPS
9991
9462
DEVICE
MONITORABLE I/O
CONTROLLABLE OUTPUTS / REQ.
9421
01 02 03 04
01 02 03 04
9423
TWO-POS. VALVE
9006
9480b
SPRING RET. VALVE
05 06
05 06
9425
1ST CYLINDICATOR
I1 I2
9495
9482b
2ND CYLINDICATOR
I3 I4
3RD CYLINDICATOR
I5 I6
9051
4TH CYLINDICATOR
I7 I8
9484b
MANUAL
9490
9427
9493
9031
EXTEND
9431
9429
9033
RETRACT
9486b
9492

FIG. 86

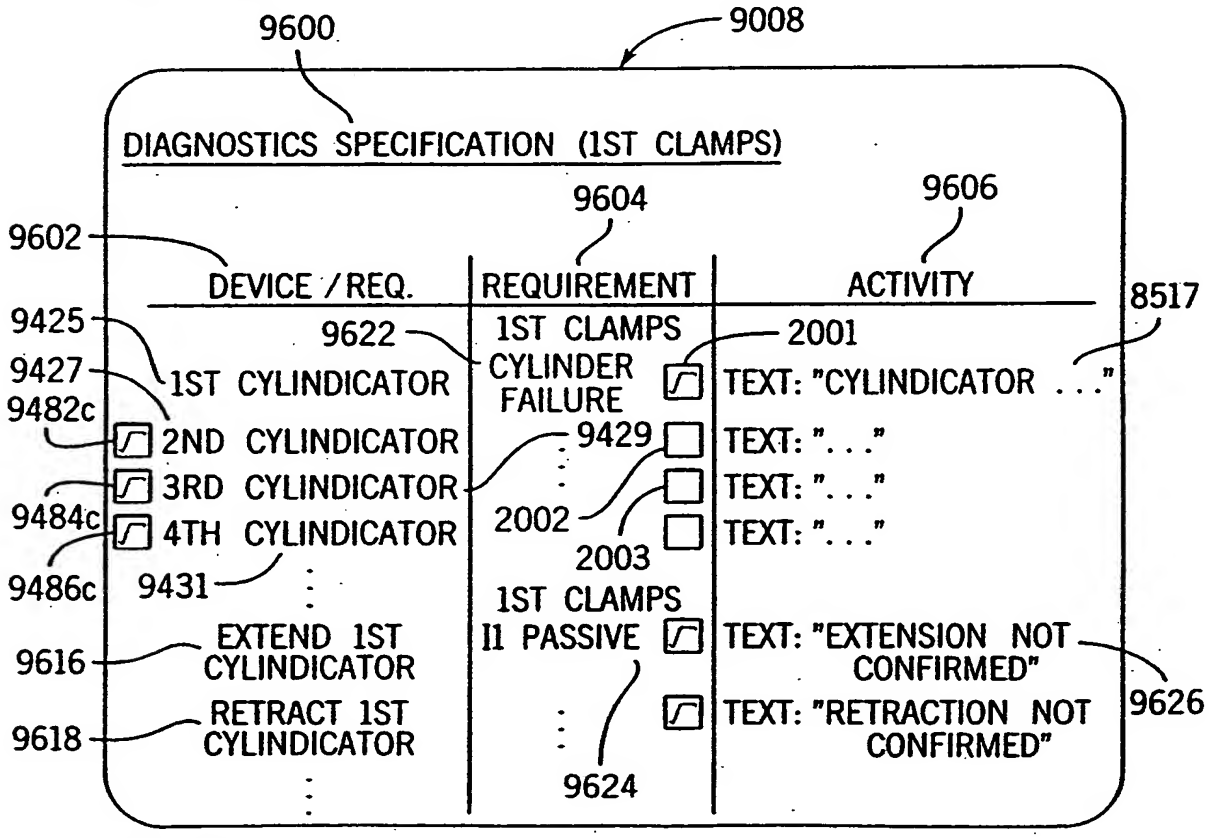

9600
9008
DIAGNOSTICS SPECIFICATION (1ST CLAMPS)
9604
9606
9602
DEVICE / REQ.
REQUIREMENT
ACTIVITY
8517
9425
9622
1ST CLAMPS
2001
9427
1ST CYLINDICATOR
CYLINDER FAILURE
TEXT: "CYLINDICATOR . . ."
9482c
2ND CYLINDICATOR
9429
TEXT: ". . ."
3RD CYLINDICATOR
TEXT: ". . ."
9484c
4TH CYLINDICATOR
2002
2003
TEXT: ". . ."
9486c
9431
1ST CLAMPS
9616
EXTEND 1ST CYLINDICATOR
I1 PASSIVE
TEXT: "EXTENSION NOT CONFIRMED"
9626
9618
RETRACT 1ST CYLINDICATOR
TEXT: "RETRACTION NOT CONFIRMED"
9624

FIG. 87

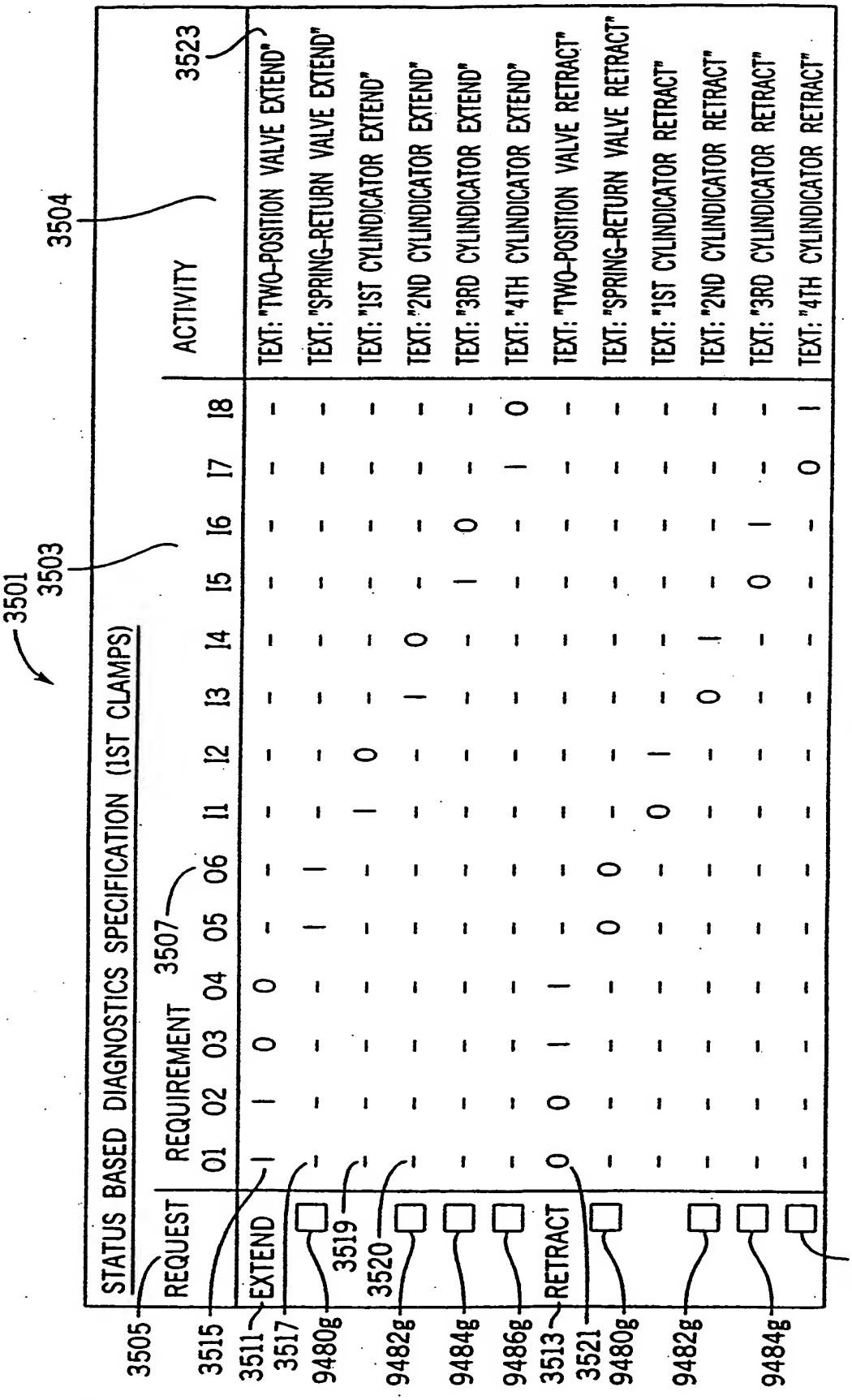

3501
3503
3504
3523
STATUS BASED DIAGNOSTICS SPECIFICATION (1ST CLAMPS)
REQUEST
REQUIREMENT 3507
01 02 03 04 05 06 I1 I2 I3 I4 I5 I6 I7 I8
ACTIVITY
EXTEND
RETRACT
TEXT: "TWO-POSITION VALVE EXTEND"
TEXT: "SPRING-RETURN VALVE EXTEND"
TEXT: "1ST CYLINDICATOR EXTEND"
TEXT: "2ND CYLINDICATOR EXTEND"
TEXT: "3RD CYLINDICATOR EXTEND"
TEXT: "4TH CYLINDICATOR EXTEND"
TEXT: "TWO-POSITION VALVE RETRACT"
TEXT: "SPRING-RETURN VALVE RETRACT"
TEXT: "1ST CYLINDICATOR RETRACT"
TEXT: "2ND CYLINDICATOR RETRACT"
TEXT: "3RD CYLINDICATOR RETRACT"
TEXT: "4TH CYLINDICATOR RETRACT"
3505
3515
3511
3517
9480g
3519
3520
9482g
9484g
9486g
3513
3521
9480g
9482g
9484g
9486g

FIG. 87A

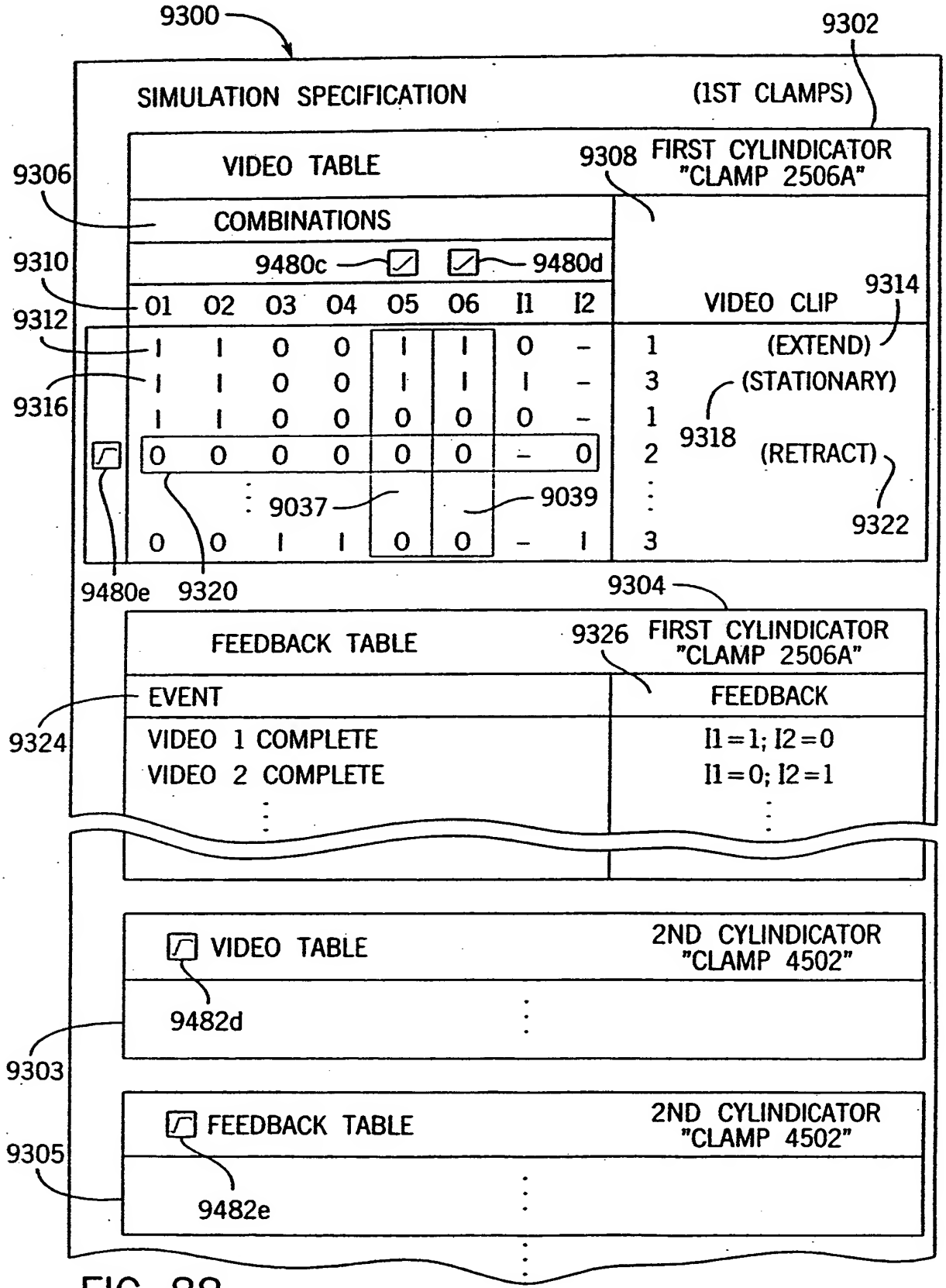

9300
9302
SIMULATION SPECIFICATION
(1ST CLAMPS)
VIDEO TABLE
9308 FIRST CYLINDICATOR "CLAMP 2506A"
9306
COMBINATIONS
9480c
9480d
9310
01 02 03 04 05 06 I1 I2
VIDEO CLIP
9314
9312
1 1 0 0 1 1 0 – 1 (EXTEND)
9316
1 1 0 0 1 1 1 – 3 (STATIONARY)
1 1 0 0 0 0 0 – 1
9318
0 0 0 0 0 0 – 0 2 (RETRACT)
9037
9039
0 0 1 1 0 0 – 1 3
9322
9480e
9320
9304
FEEDBACK TABLE
9326 FIRST CYLINDICATOR "CLAMP 2506A"
EVENT
FEEDBACK
9324
VIDEO 1 COMPLETE
I1=1; I2=0
VIDEO 2 COMPLETE
I1=0; I2=1
VIDEO TABLE
2ND CYLINDICATOR "CLAMP 4502"
9482d
9303
FEEDBACK TABLE
2ND CYLINDICATOR "CLAMP 4502"
9305
9482e

FIG. 88

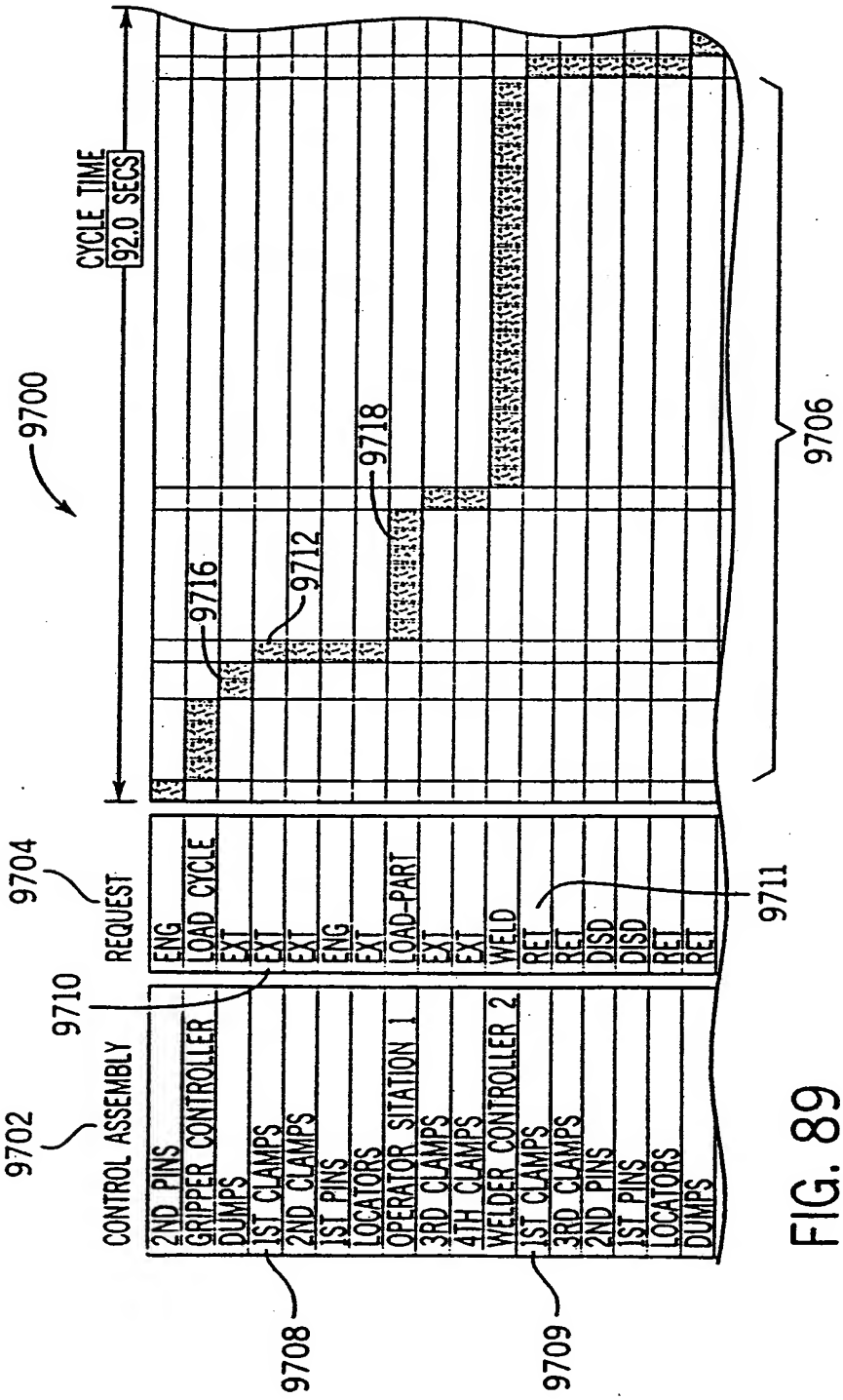

9700
CYCLE TIME
92.0 SECS
9716
9712
9718
9706
9704
REQUEST
9710
9702
CONTROL ASSEMBLY
2ND PINS
GRIPPER CONTROLLER
DUMPS
1ST CLAMPS
2ND CLAMPS
1ST PINS
LOCATORS
OPERATOR SITATION 1
3RD CLAMPS
4TH CLAMPS
WELDER CONTROLLER 2
1ST CLAMPS
3RD CLAMPS
2ND PINS
1ST PINS
LOCATORS
DUMPS
ENG
LOAD CYCLE
EXT
EXT
EXT
ENG
EXT
LOAD-PART
EXT
EXT
WELD
RET
RET
DISD
DISD
RET
RET
9711
9708
9709

FIG. 89

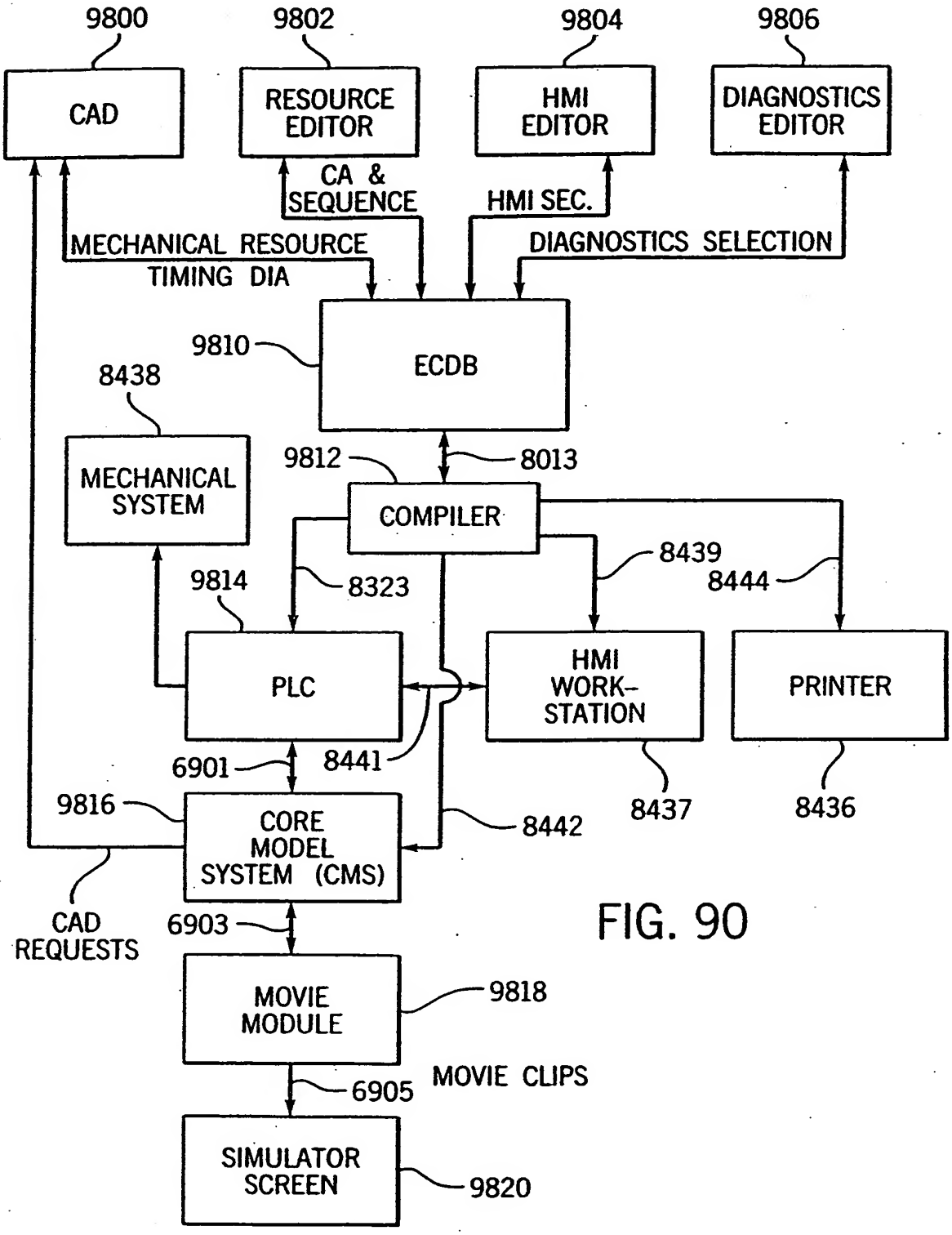

9800
9802
9804
9806
CAD
RESOURCE EDITOR
HMI EDITOR
DIAGNOSTICS EDITOR
CA & SEQUENCE
HMI SEC.
MECHANICAL RESOURCE TIMING DIA
DIAGNOSTICS SELECTION
9810
ECDB
8438
MECHANICAL SYSTEM
9812
8013
COMPILER
8439
8444
9814
8323
PLC
HMI WORK-STATION
PRINTER
6901
8441
8437
8436
9816
CORE MODEL SYSTEM (CMS)
8442
CAD REQUESTS
6903
MOVIE MODULE
9818
MOVIE CLIPS
6905
SIMULATOR SCREEN
9820

FIG. 90

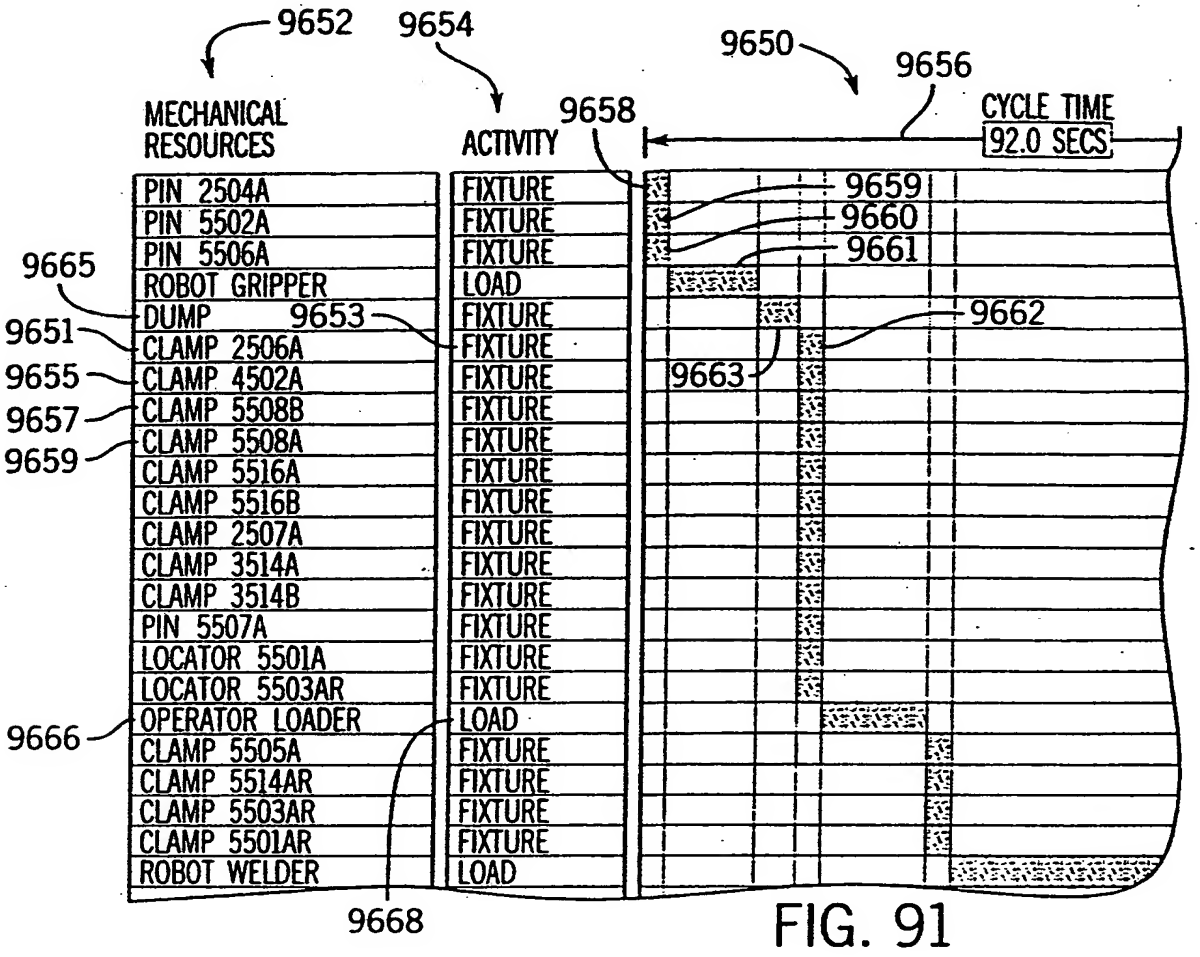

9652
9654
9650
9656
MECHANICAL RESOURCES
ACTIVITY
9658
CYCLE TIME
92.0 SECS
PIN 2504A
PIN 5502A
PIN 5506A
ROBOT GRIPPER
DUMP
CLAMP 2506A
CLAMP 4502A
CLAMP 5508B
CLAMP 5508A
CLAMP 5516A
CLAMP 5516B
CLAMP 2507A
CLAMP 3514A
CLAMP 3514B
PIN 5507A
LOCATOR 5501A
LOCATOR 5503AR
OPERATOR LOADER
CLAMP 5505A
CLAMP 5514AR
CLAMP 5503AR
CLAMP 5501AR
ROBOT WELDER
FIXTURE
LOAD
9659
9660
9661
9662
9663
9653
9665
9651
9655
9657
9659
9666
9668

FIG. 91

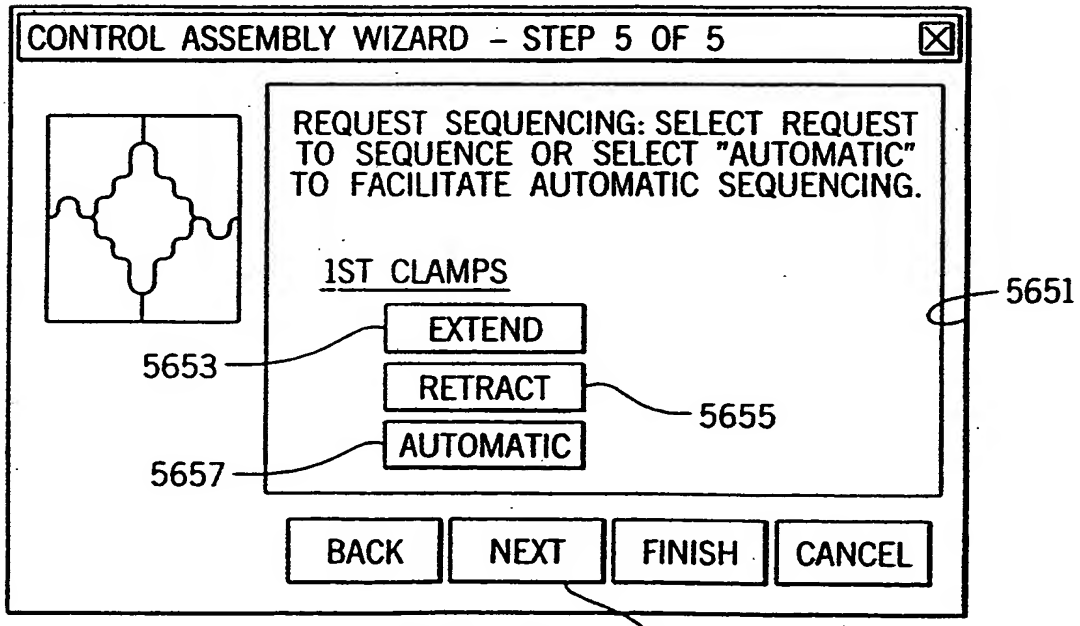

CONTROL ASSEMBLY WIZARD – STEP 5 OF 5
REQUEST SEQUENCING: SELECT REQUEST TO SEQUENCE OR SELECT "AUTOMATIC" TO FACILITATE AUTOMATIC SEQUENCING.
1ST CLAMPS
EXTEND
RETRACT
AUTOMATIC
5651
5653
5655
5657
BACK
NEXT
FINISH
CANCEL
5558

FIG. 92

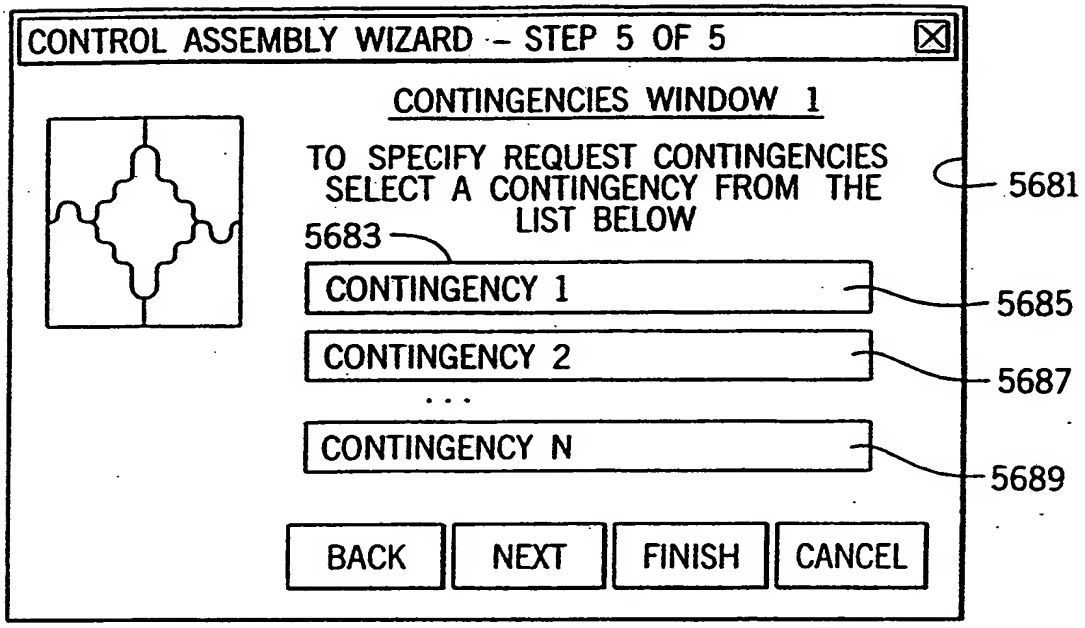

CONTROL ASSEMBLY WIZARD – STEP 5 OF 5
CONTINGENCIES WINDOW 1
TO SPECIFY REQUEST CONTINGENCIES SELECT A CONTINGENCY FROM THE LIST BELOW
5681
5683
CONTINGENCY 1
5685
CONTINGENCY 2
5687
. . .
CONTINGENCY N
5689
BACK
NEXT
FINISH
CANCEL

FIG. 93

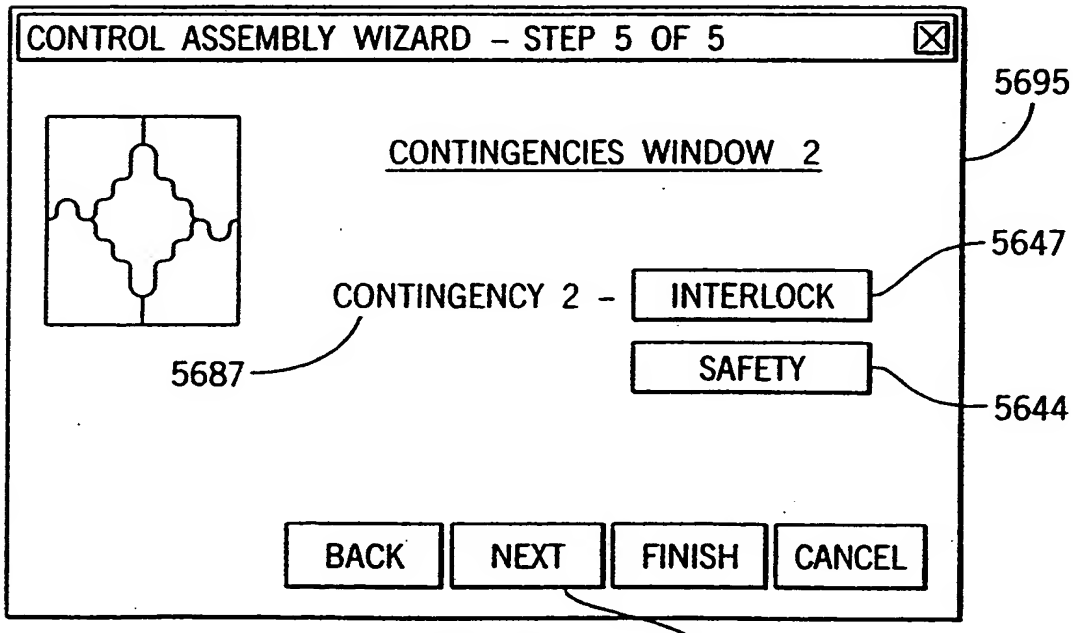

CONTROL ASSEMBLY WIZARD – STEP 5 OF 5
5695
CONTINGENCIES WINDOW 2
5647
CONTINGENCY 2 –
INTERLOCK
5687
SAFETY
5644
BACK
NEXT
FINISH
CANCEL
5558

FIG. 94

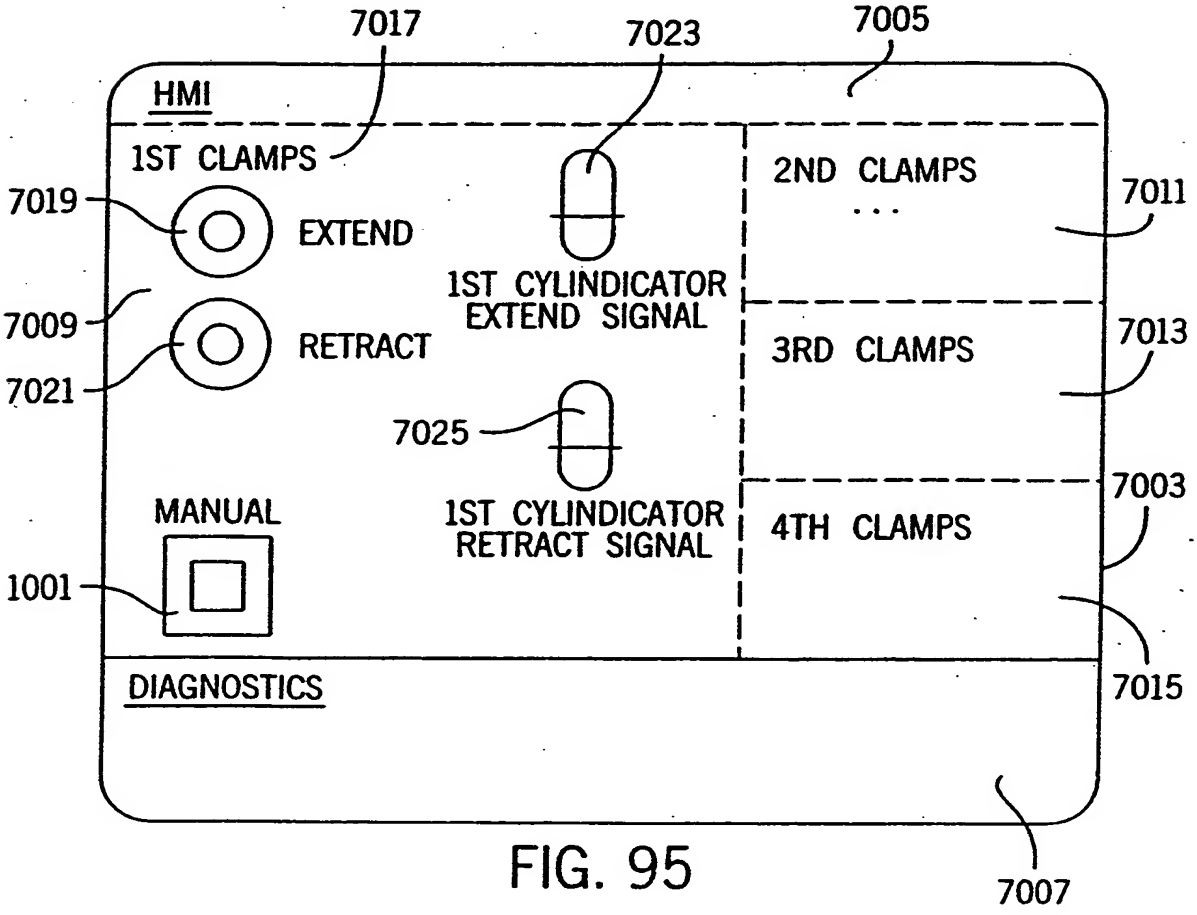

7017
7023
7005
HMI
1ST CLAMPS
2ND CLAMPS
...
7019
EXTEND
7011
1ST CYLINDICATOR
EXTEND SIGNAL
7009
RETRACT
3RD CLAMPS
7013
7021
7025
7003
MANUAL
1ST CYLINDICATOR
RETRACT SIGNAL
4TH CLAMPS
1001
7015
DIAGNOSTICS
7007

FIG. 95

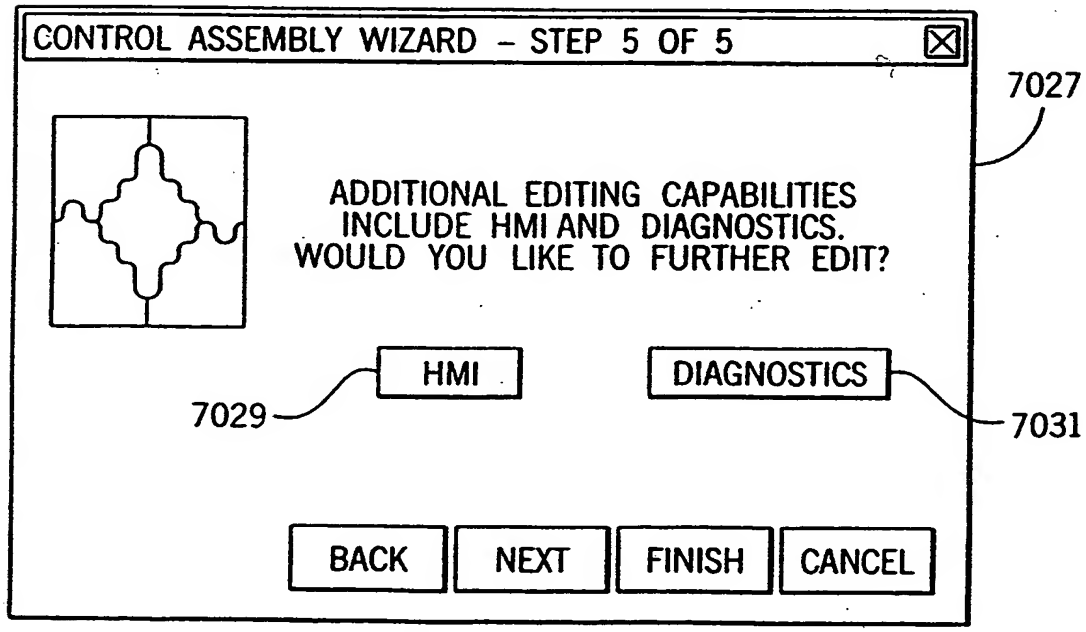

CONTROL ASSEMBLY WIZARD – STEP 5 OF 5
7027
ADDITIONAL EDITING CAPABILITIES
INCLUDE HMI AND DIAGNOSTICS.
WOULD YOU LIKE TO FURTHER EDIT?
HMI
DIAGNOSTICS
7029
7031
BACK
NEXT
FINISH
CANCEL

FIG. 96

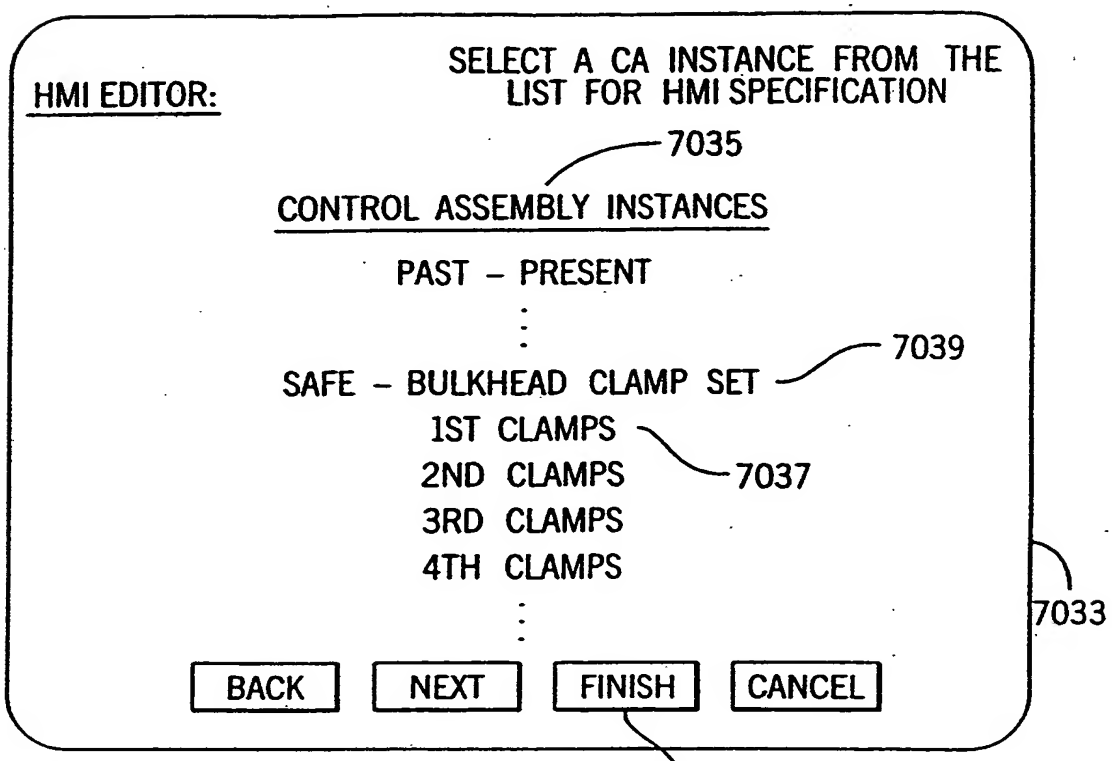

HMI EDITOR:
SELECT A CA INSTANCE FROM THE LIST FOR HMI SPECIFICATION
7035
CONTROL ASSEMBLY INSTANCES
PAST – PRESENT
7039
SAFE – BULKHEAD CLAMP SET
1ST CLAMPS
2ND CLAMPS
3RD CLAMPS
4TH CLAMPS
7037
7033
BACK
NEXT
FINISH
CANCEL
7061

FIG. 97

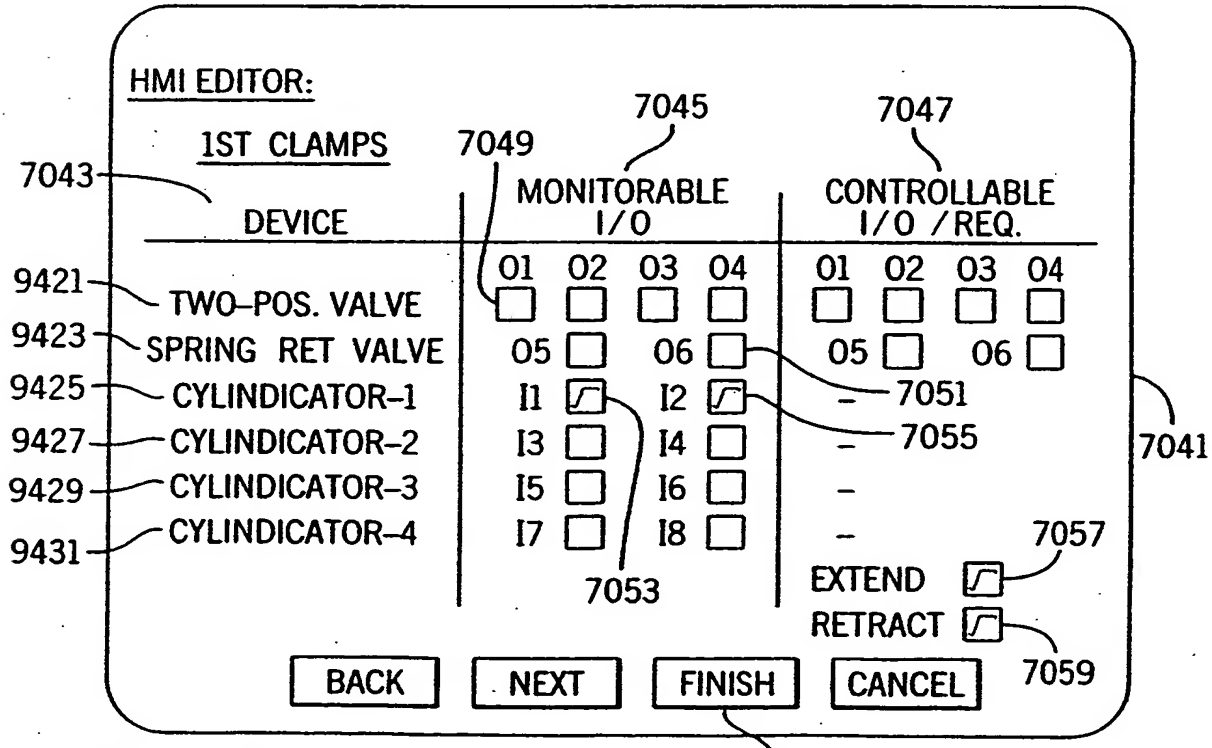

HMI EDITOR:
1ST CLAMPS
7043
7045
7047
7049
DEVICE
MONITORABLE I/O
CONTROLLABLE I/O /REQ.
01 02 03 04
01 02 03 04
9421 TWO–POS. VALVE
9423 SPRING RET VALVE
05 06
05 06
9425 CYLINDICATOR–1
I1 I2
7051
9427 CYLINDICATOR–2
I3 I4
7055
9429 CYLINDICATOR–3
I5 I6
9431 CYLINDICATOR–4
I7 I8
7057
7053
EXTEND
RETRACT
7059
7041
BACK
NEXT
FINISH
CANCEL
7601

FIG. 98

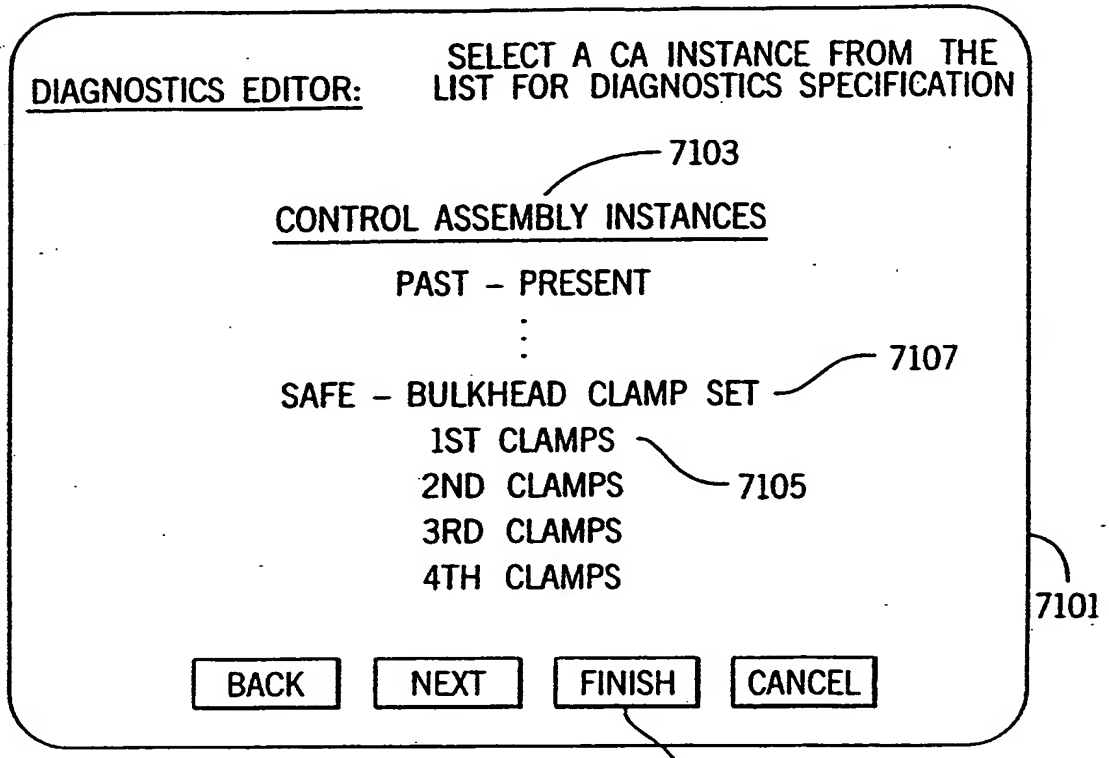


FIG. 99

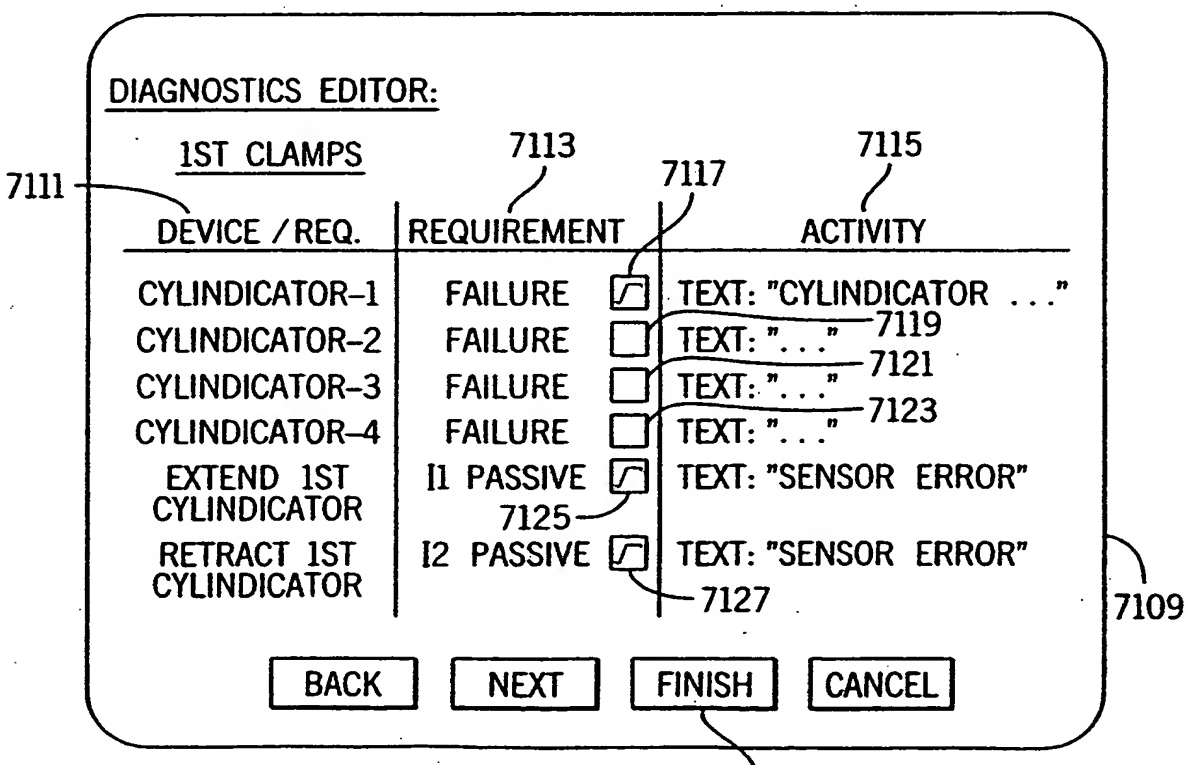


FIG. 100

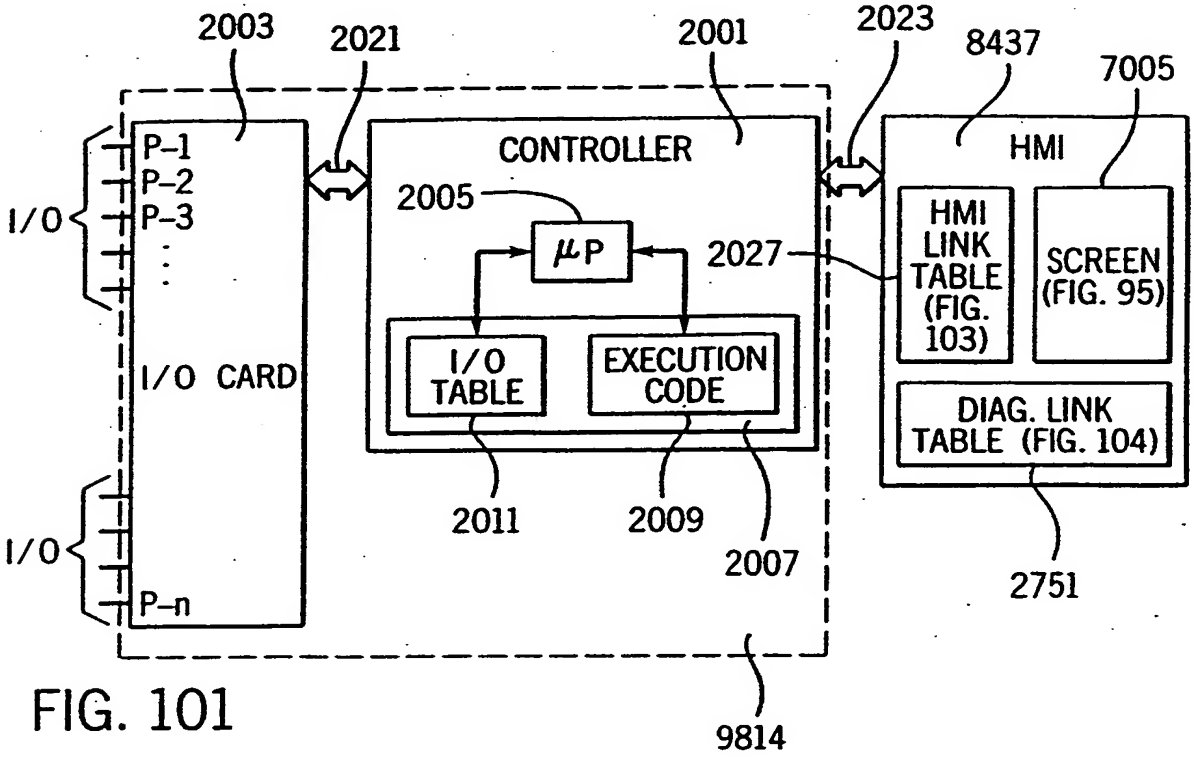


FIG. 101

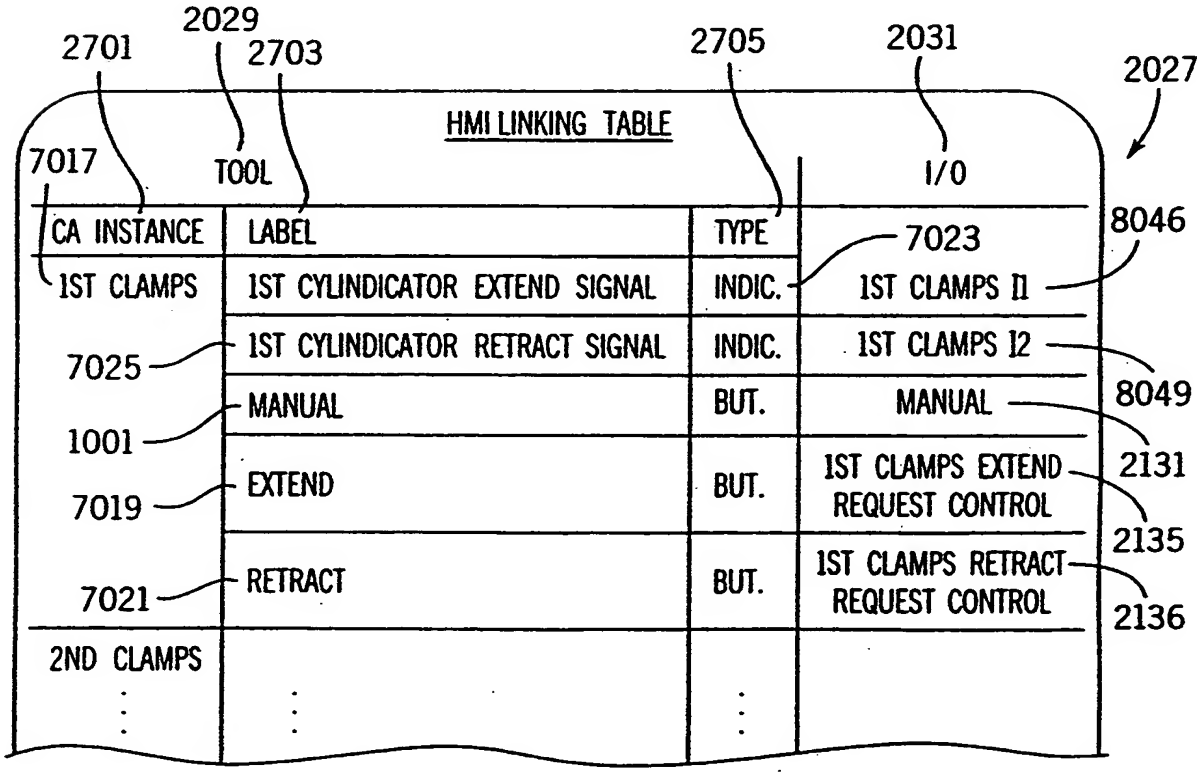


FIG. 103

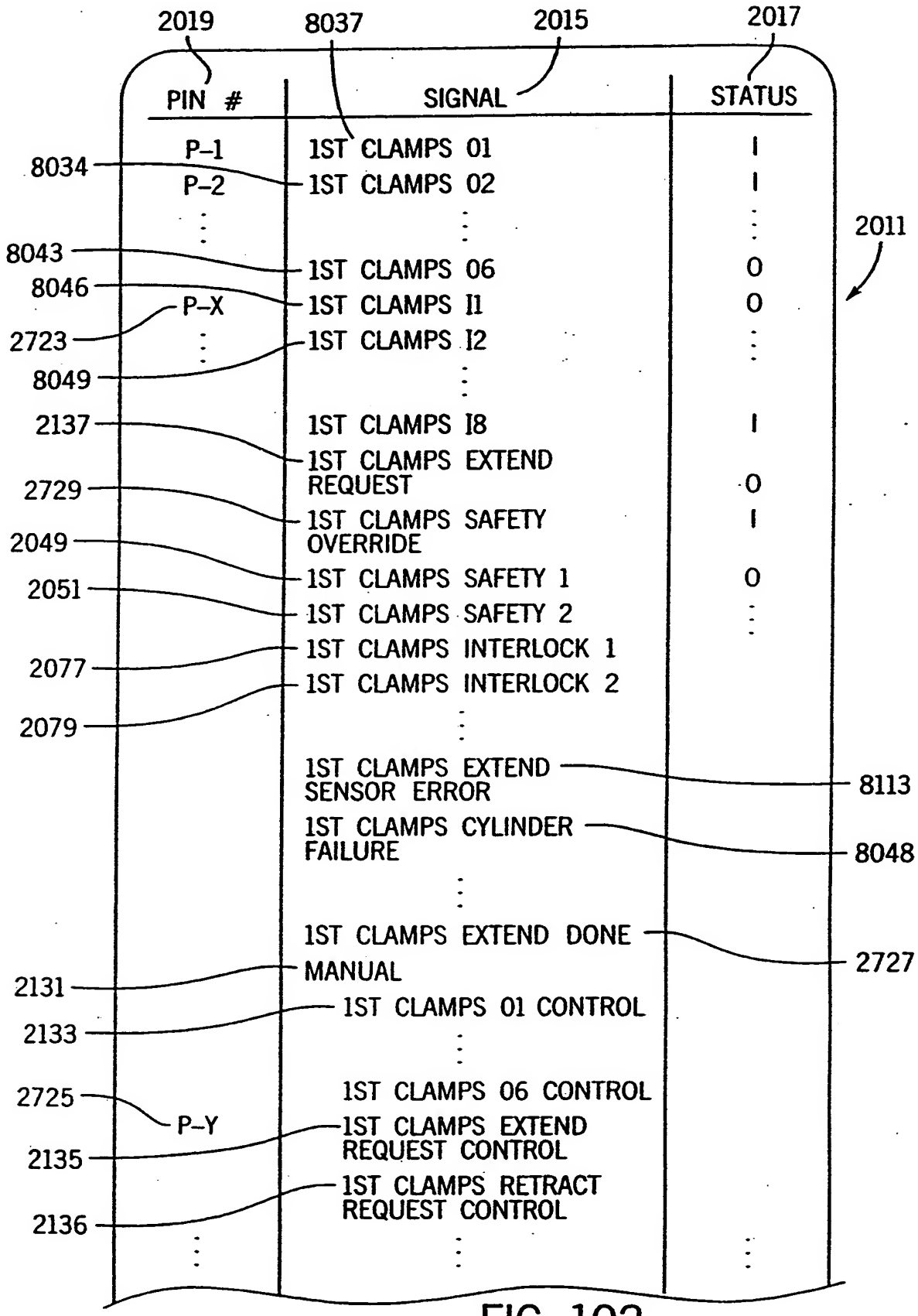

2019
8037
2015
2017
PIN #
SIGNAL
STATUS
P-1
1ST CLAMPS 01
I
8034
P-2
1ST CLAMPS 02
I
2011
8043
1ST CLAMPS 06
0
8046
1ST CLAMPS I1
0
P-X
2723
1ST CLAMPS I2
8049
2137
1ST CLAMPS I8
I
1ST CLAMPS EXTEND REQUEST
2729
0
1ST CLAMPS SAFETY OVERRIDE
2049
I
1ST CLAMPS SAFETY 1
2051
0
1ST CLAMPS SAFETY 2
1ST CLAMPS INTERLOCK 1
2077
1ST CLAMPS INTERLOCK 2
2079
1ST CLAMPS EXTEND SENSOR ERROR
8113
1ST CLAMPS CYLINDER FAILURE
8048
1ST CLAMPS EXTEND DONE
2727
MANUAL
2131
1ST CLAMPS 01 CONTROL
2133
1ST CLAMPS 06 CONTROL
2725
P-Y
1ST CLAMPS EXTEND REQUEST CONTROL
2135
1ST CLAMPS RETRACT REQUEST CONTROL
2136

FIG. 102

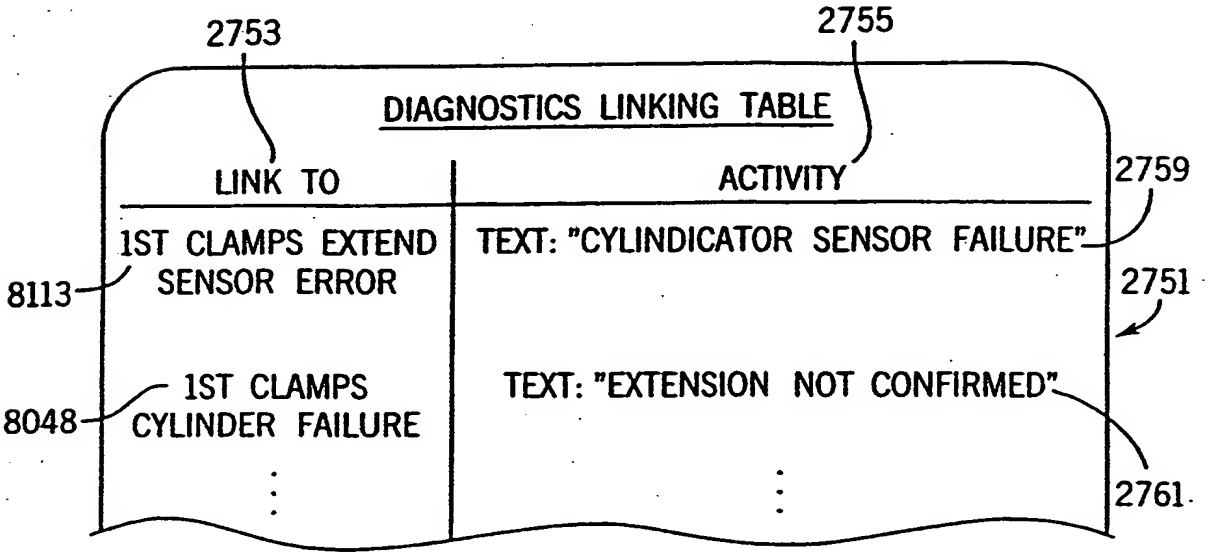


FIG. 104

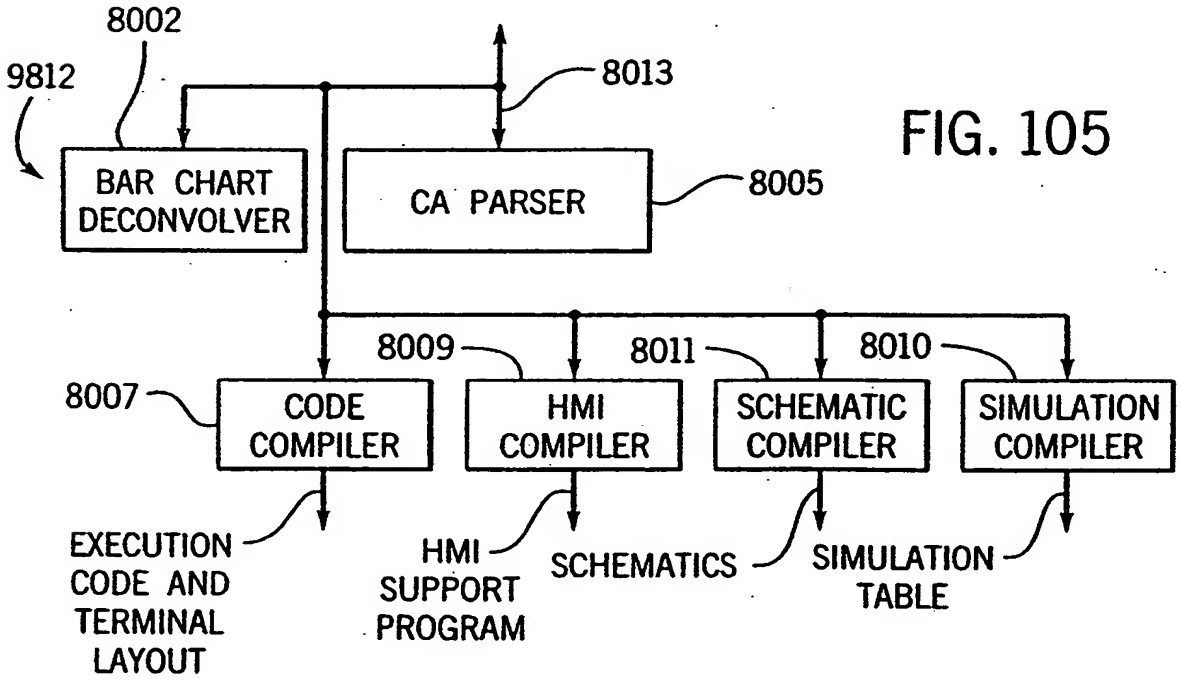


FIG. 105

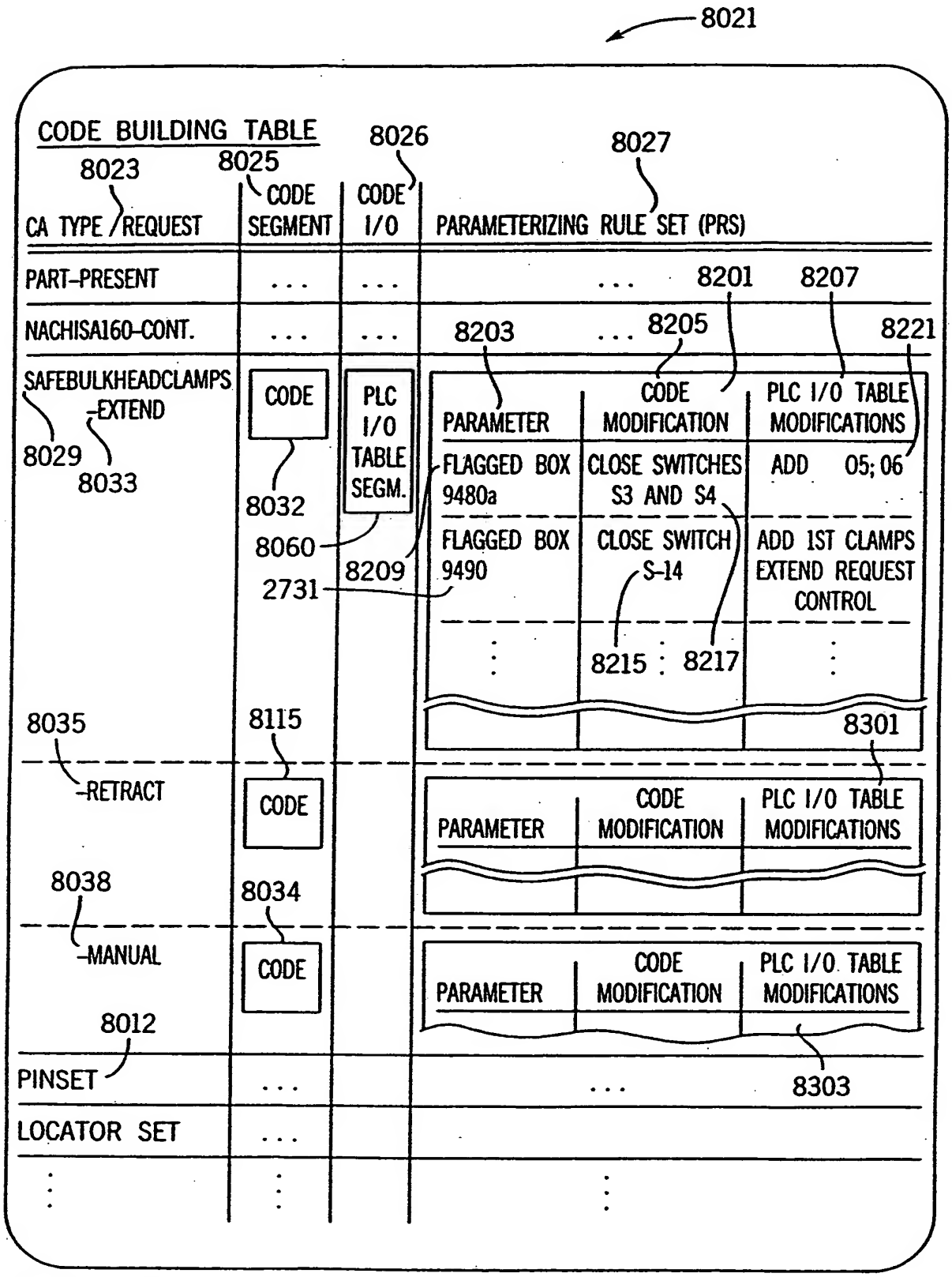

8021
CODE BUILDING TABLE
8023
8025
8026
8027
CA TYPE / REQUEST
CODE SEGMENT
CODE I/O
PARAMETERIZING RULE SET (PRS)
PART-PRESENT
NACHISA160-CONT.
8201
8207
8203
8205
8221
SAFEBULKHEADCLAMPS
-EXTEND
8029
8033
CODE
8032
PLC I/O TABLE SEGM.
8060
8209
2731
PARAMETER
CODE MODIFICATION
PLC I/O TABLE MODIFICATIONS
FLAGGED BOX 9480a
CLOSE SWITCHES S3 AND S4
ADD 05; 06
FLAGGED BOX 9490
CLOSE SWITCH S-14
ADD 1ST CLAMPS EXTEND REQUEST CONTROL
8215
8217
8035
8115
8301
-RETRACT
CODE
PARAMETER
CODE MODIFICATION
PLC I/O TABLE MODIFICATIONS
8038
8034
-MANUAL
CODE
8012
PARAMETER
CODE MODIFICATION
PLC I/O TABLE MODIFICATIONS
PINSET
8303
LOCATOR SET

FIG. 106

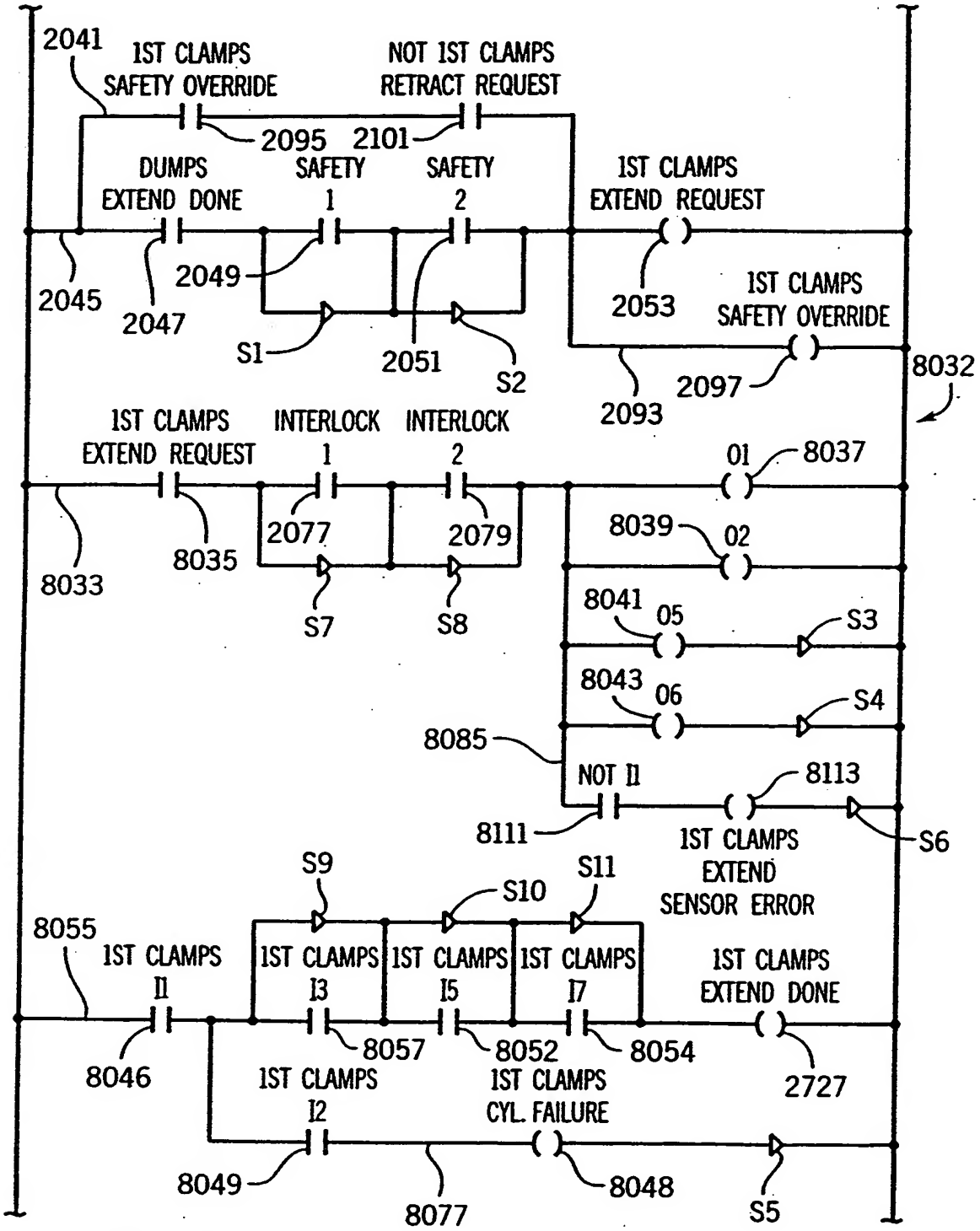

2041
1ST CLAMPS SAFETY OVERRIDE
2095
NOT 1ST CLAMPS RETRACT REQUEST
2101
DUMPS EXTEND DONE
2045
2047
SAFETY 1
2049
S1
SAFETY 2
2051
S2
1ST CLAMPS EXTEND REQUEST
2053
2093
1ST CLAMPS SAFETY OVERRIDE
2097
8032
1ST CLAMPS EXTEND REQUEST
8033
8035
INTERLOCK 1
2077
S7
INTERLOCK 2
2079
S8
01
8037
8039
02
8041
05
S3
8043
06
S4
8085
NOT I1
8111
8113
S6
1ST CLAMPS EXTEND SENSOR ERROR
S9
S10
S11
8055
1ST CLAMPS I1
8046
1ST CLAMPS I3
8057
1ST CLAMPS I5
8052
1ST CLAMPS I7
8054
1ST CLAMPS EXTEND DONE
2727
1ST CLAMPS I2
8049
8077
1ST CLAMPS CYL. FAILURE
8048
S5

FIG. 107

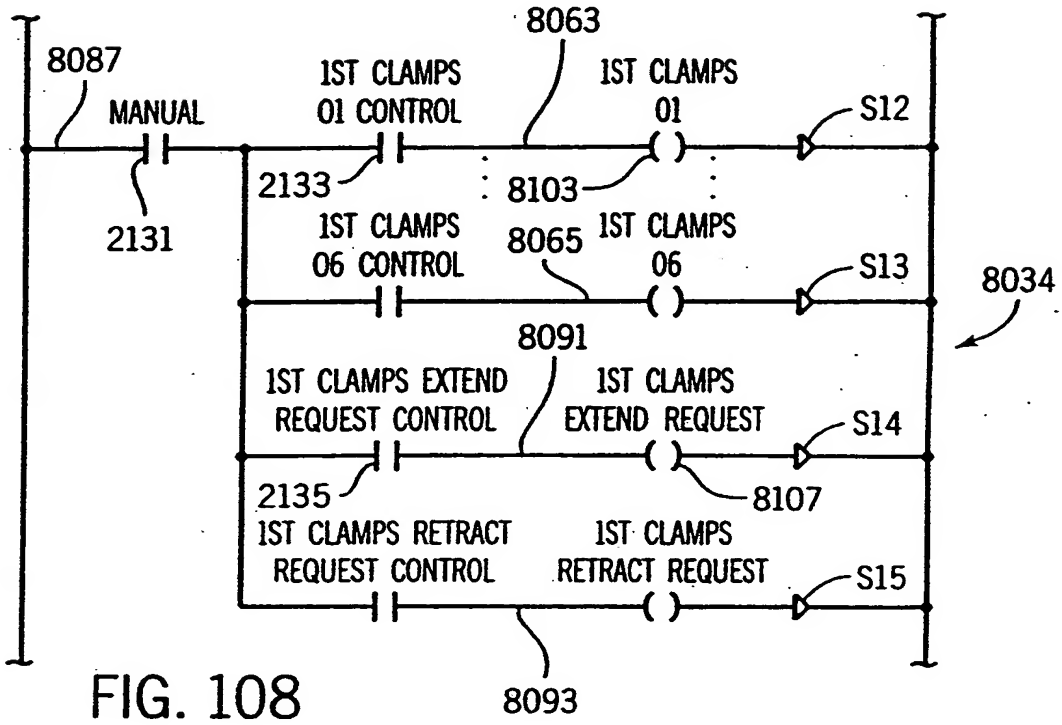

8087
MANUAL
2131
1ST CLAMPS
01 CONTROL
2133
8063
1ST CLAMPS
01
8103
S12
1ST CLAMPS
06 CONTROL
8065
1ST CLAMPS
06
S13
8034
8091
1ST CLAMPS EXTEND
REQUEST CONTROL
2135
1ST CLAMPS
EXTEND REQUEST
8107
S14
1ST CLAMPS RETRACT
REQUEST CONTROL
1ST CLAMPS
RETRACT REQUEST
S15
8093

FIG. 108

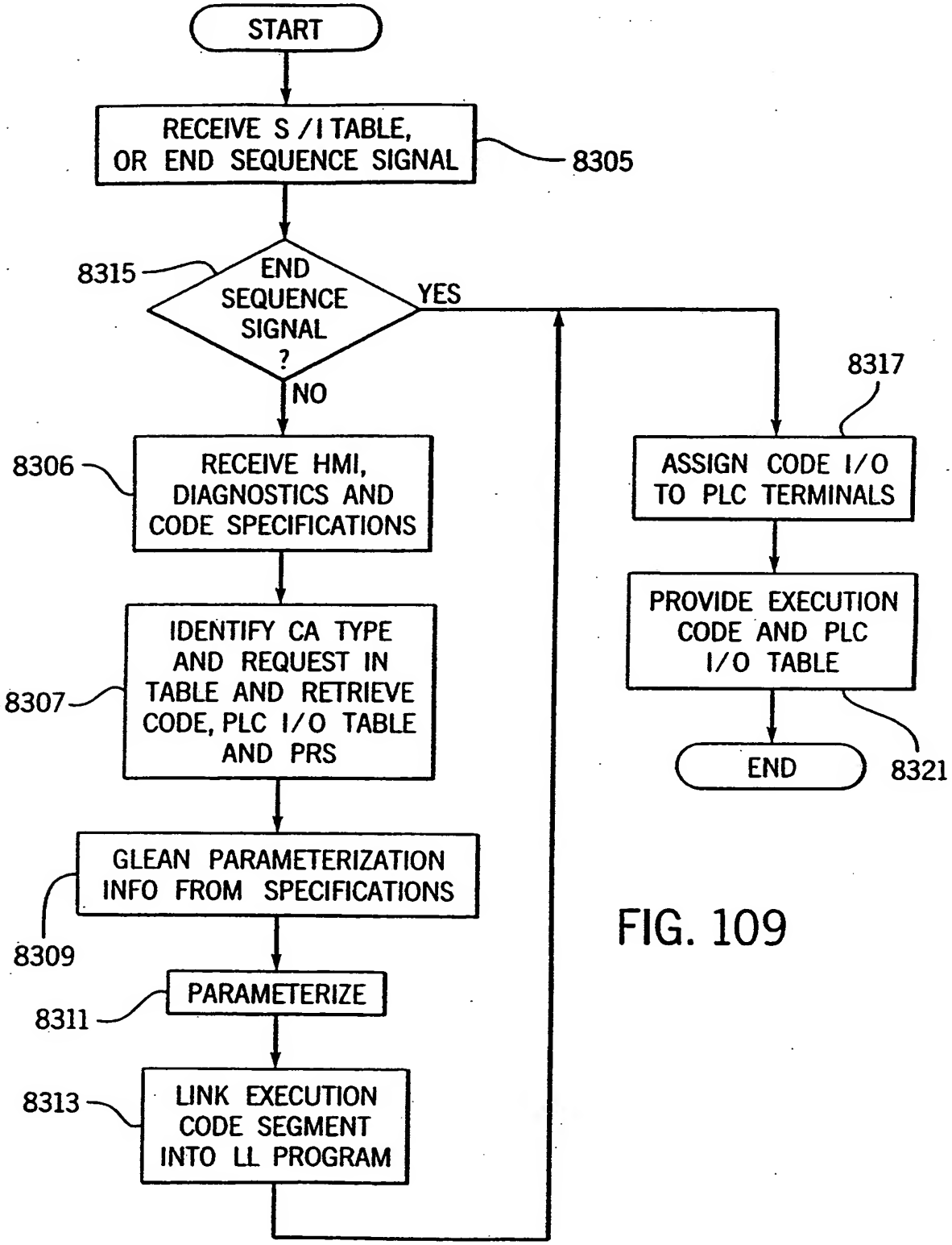

START
RECEIVE S /I TABLE, OR END SEQUENCE SIGNAL
8305
8315
END SEQUENCE SIGNAL ?
YES
NO
8317
8306
RECEIVE HMI, DIAGNOSTICS AND CODE SPECIFICATIONS
ASSIGN CODE I/O TO PLC TERMINALS
IDENTIFY CA TYPE AND REQUEST IN TABLE AND RETRIEVE CODE, PLC I/O TABLE AND PRS
8307
PROVIDE EXECUTION CODE AND PLC I/O TABLE
END
8321
GLEAN PARAMETERIZATION INFO FROM SPECIFICATIONS
8309
PARAMETERIZE
8311
LINK EXECUTION CODE SEGMENT INTO LL PROGRAM
8313

FIG. 109

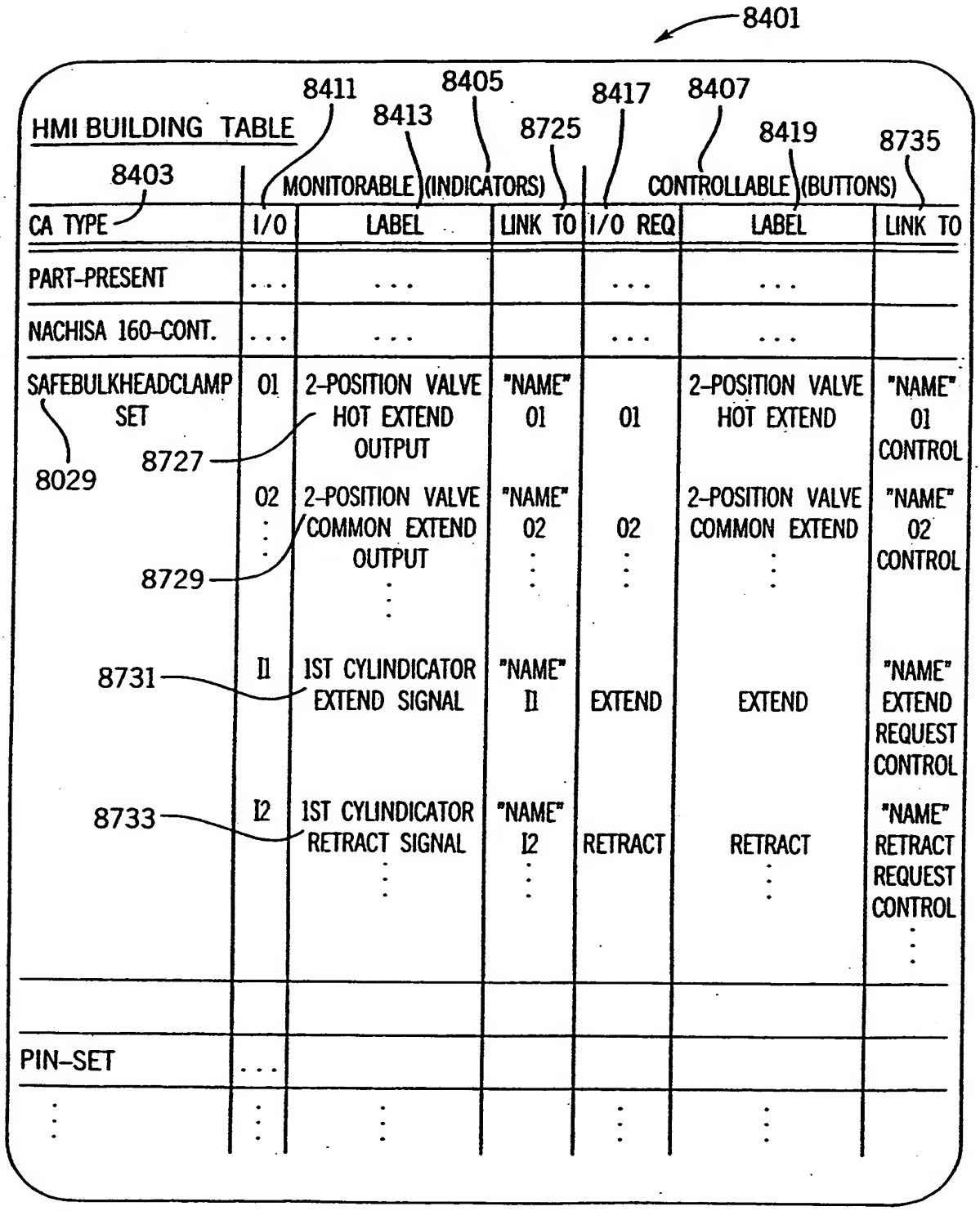

8401
HMI BUILDING TABLE
8411
8413
8405
8725
8417
8407
8419
8735
8403
MONITORABLE (INDICATORS)
CONTROLLABLE (BUTTONS)
CA TYPE
I/O
LABEL
LINK TO
I/O REQ
LABEL
LINK TO
PART-PRESENT
NACHISA 160-CONT.
SAFEBULKHEADCLAMP SET
8029
01
2-POSITION VALVE HOT EXTEND OUTPUT
8727
"NAME" 01
01
2-POSITION VALVE HOT EXTEND
"NAME" 01 CONTROL
02
2-POSITION VALVE COMMON EXTEND OUTPUT
8729
"NAME" 02
02
2-POSITION VALVE COMMON EXTEND
"NAME" 02 CONTROL
I1
8731
1ST CYLINDICATOR EXTEND SIGNAL
"NAME" I1
EXTEND
EXTEND
"NAME" EXTEND REQUEST CONTROL
I2
8733
1ST CYLINDICATOR RETRACT SIGNAL
"NAME" I2
RETRACT
RETRACT
"NAME" RETRACT REQUEST CONTROL
PIN-SET

FIG. 110

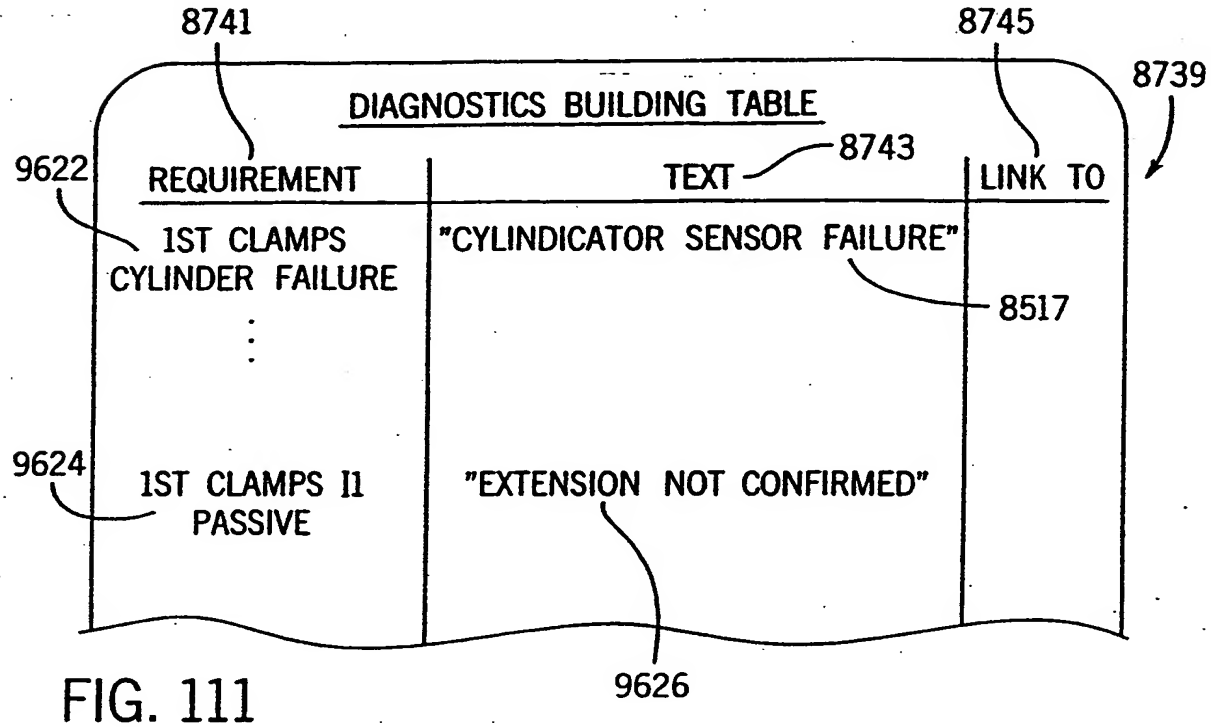


FIG. 111

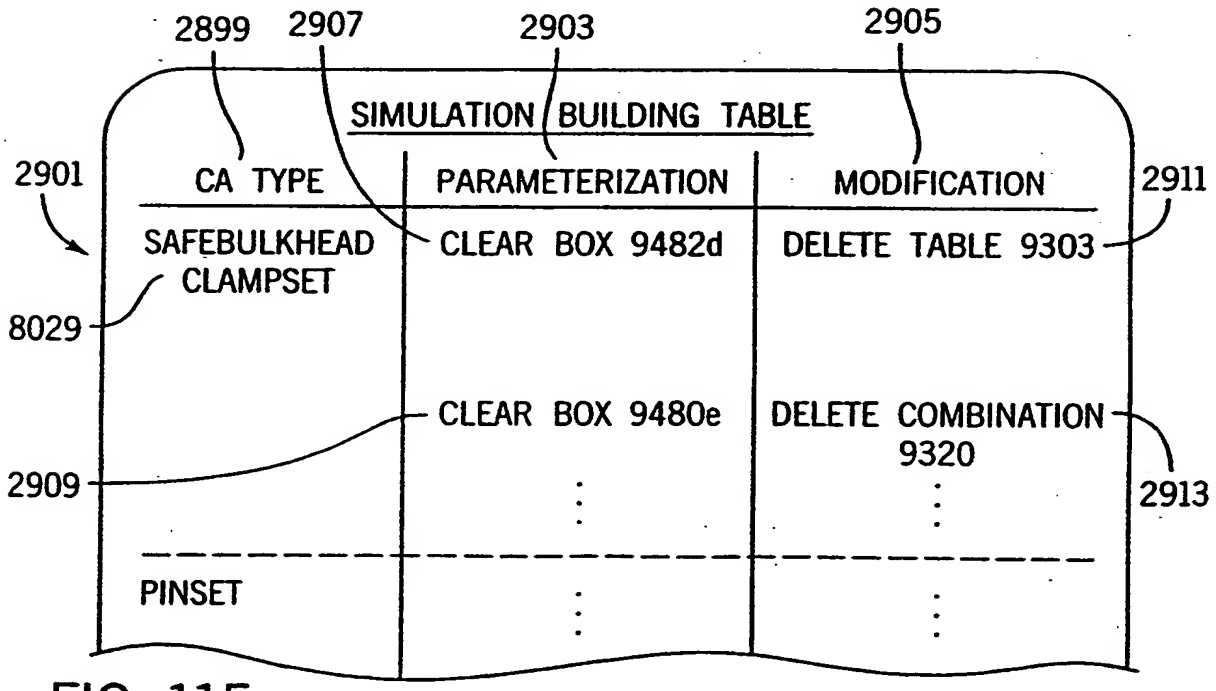


FIG. 115

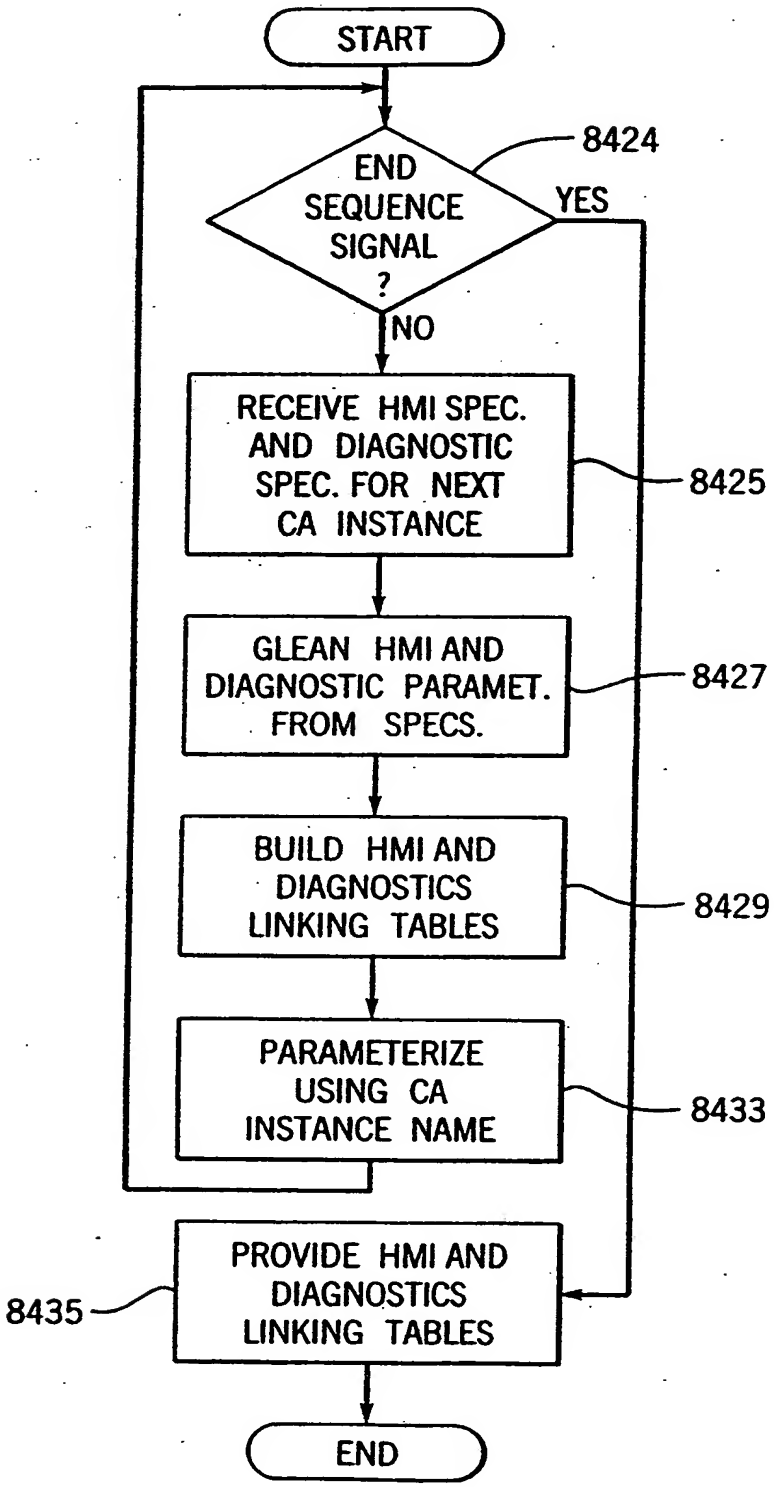

START
END SEQUENCE SIGNAL ?
8424
YES
NO
RECEIVE HMI SPEC. AND DIAGNOSTIC SPEC. FOR NEXT CA INSTANCE
8425
GLEAN HMI AND DIAGNOSTIC PARAMET. FROM SPECS.
8427
BUILD HMI AND DIAGNOSTICS LINKING TABLES
8429
PARAMETERIZE USING CA INSTANCE NAME
8433
PROVIDE HMI AND DIAGNOSTICS LINKING TABLES
8435
END

FIG. 112

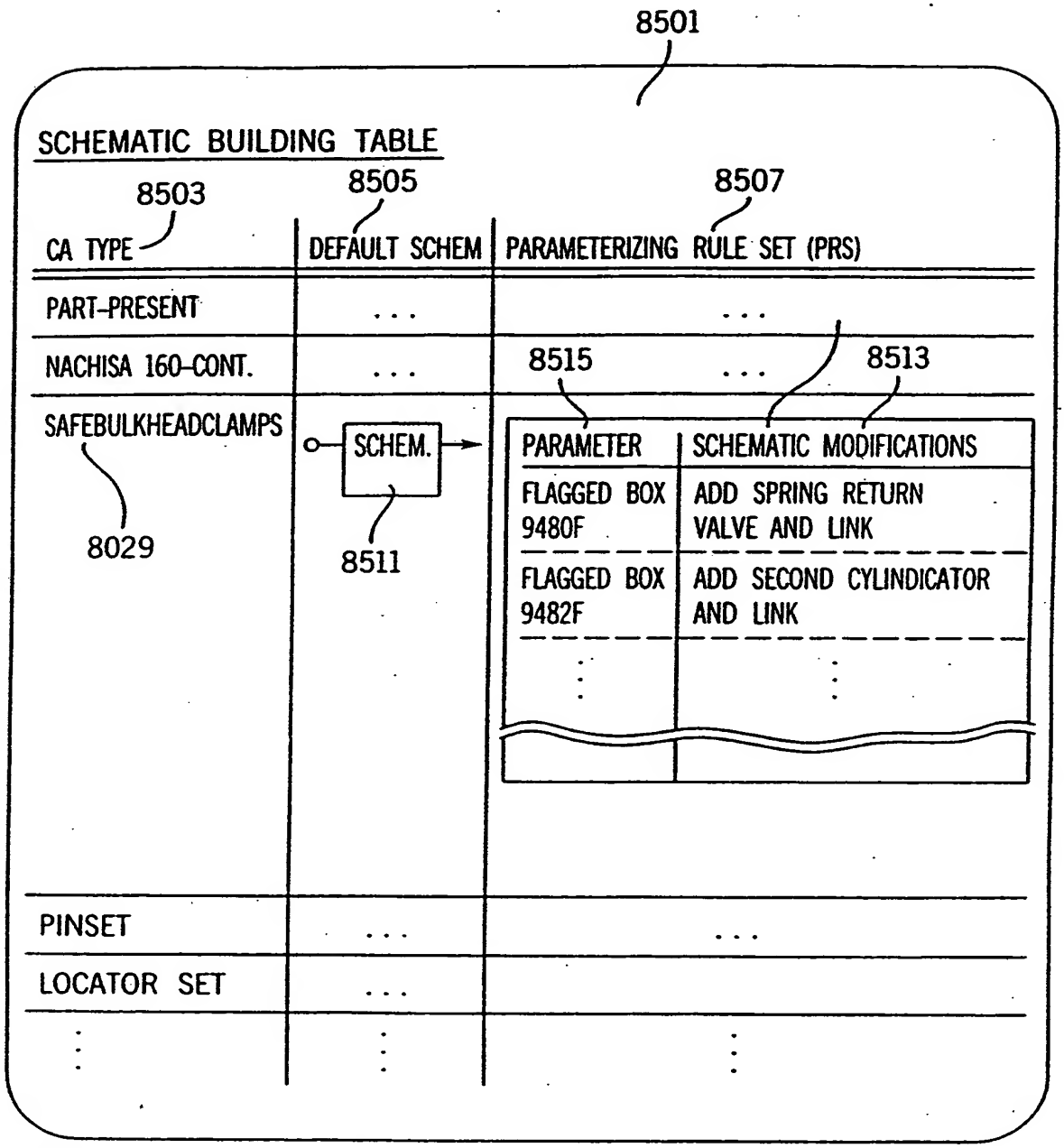

8501
SCHEMATIC BUILDING TABLE
8503
8505
8507
CA TYPE
DEFAULT SCHEM
PARAMETERIZING RULE SET (PRS)
PART-PRESENT
NACHISA 160-CONT.
8515
8513
SAFEBULKHEADCLAMPS
SCHEM.
8029
8511
PARAMETER
SCHEMATIC MODIFICATIONS
FLAGGED BOX 9480F
ADD SPRING RETURN VALVE AND LINK
FLAGGED BOX 9482F
ADD SECOND CYLINDICATOR AND LINK
PINSET
LOCATOR SET

FIG. 113

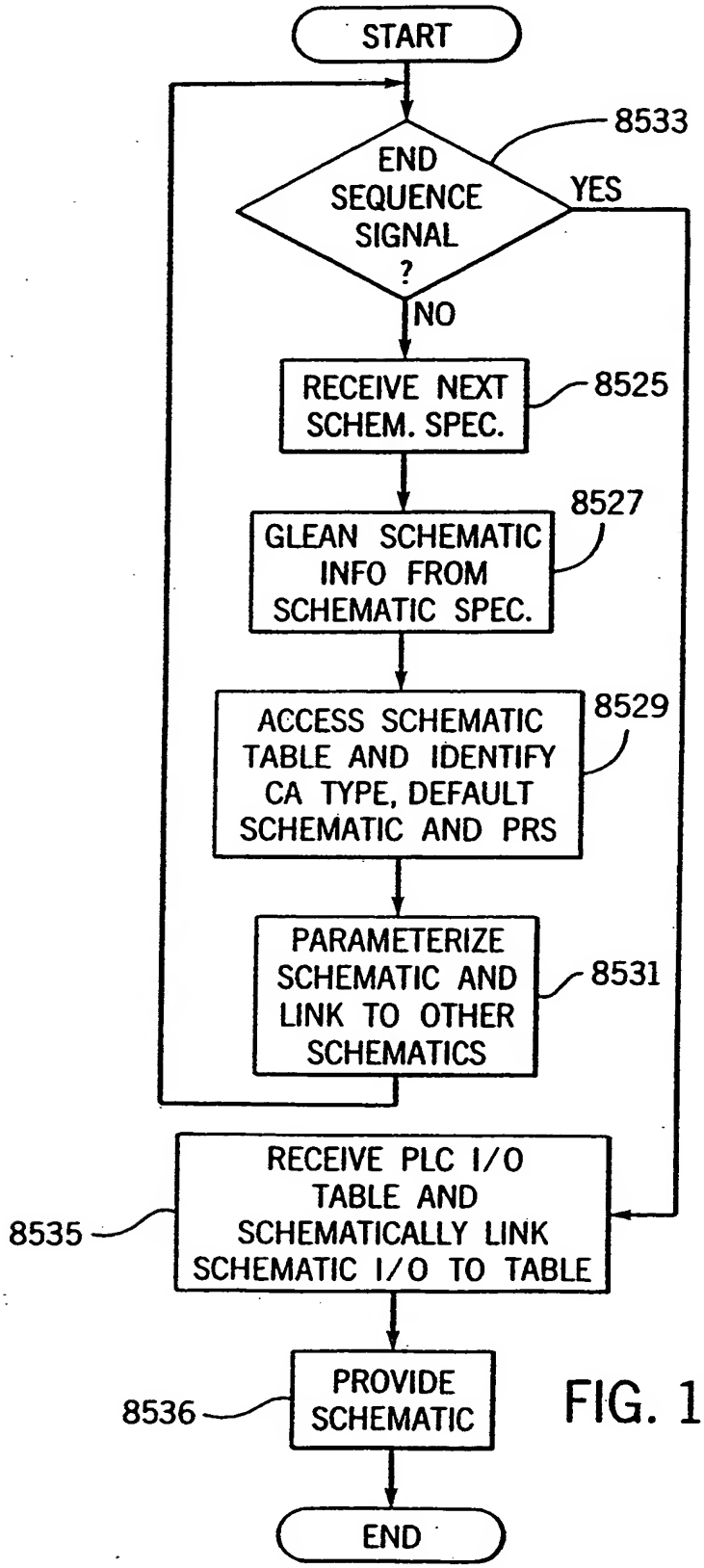

START
END SEQUENCE SIGNAL ?
8533
YES
NO
RECEIVE NEXT SCHEM. SPEC.
8525
GLEAN SCHEMATIC INFO FROM SCHEMATIC SPEC.
8527
ACCESS SCHEMATIC TABLE AND IDENTIFY CA TYPE, DEFAULT SCHEMATIC AND PRS
8529
PARAMETERIZE SCHEMATIC AND LINK TO OTHER SCHEMATICS
8531
RECEIVE PLC I/O TABLE AND SCHEMATICALLY LINK SCHEMATIC I/O TO TABLE
8535
PROVIDE SCHEMATIC
8536
END

FIG. 114

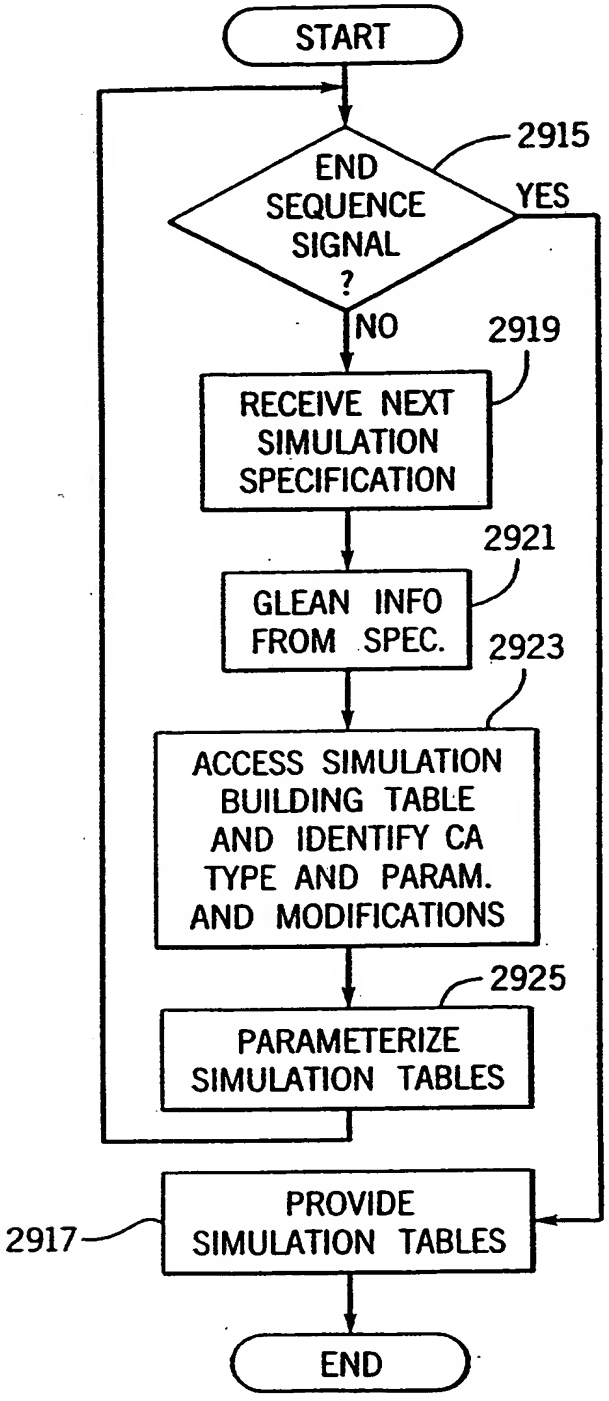
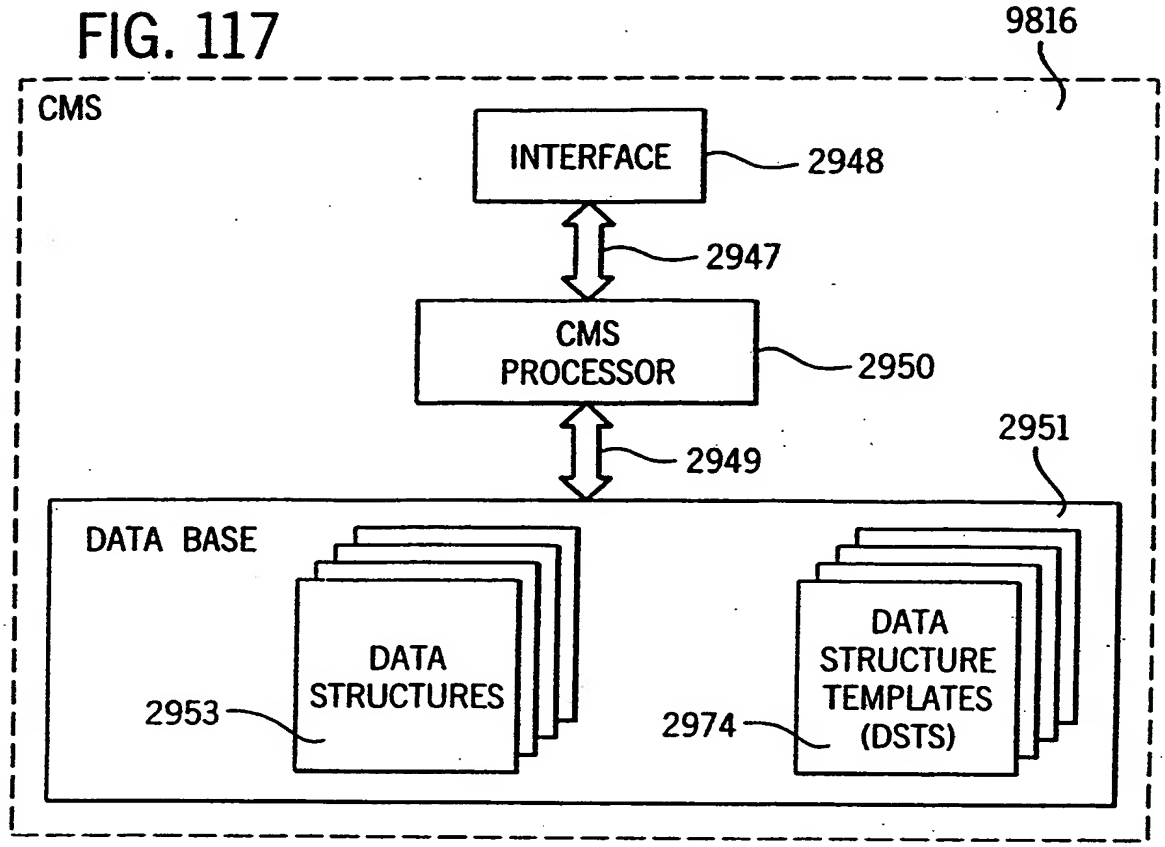

START
2915
END SEQUENCE SIGNAL ?
YES
NO
2919
RECEIVE NEXT SIMULATION SPECIFICATION
2921
GLEAN INFO FROM SPEC.
2923
ACCESS SIMULATION BUILDING TABLE AND IDENTIFY CA TYPE AND PARAM. AND MODIFICATIONS
2925
PARAMETERIZE SIMULATION TABLES
2917
PROVIDE SIMULATION TABLES
END

FIG. 116

FIG. 117



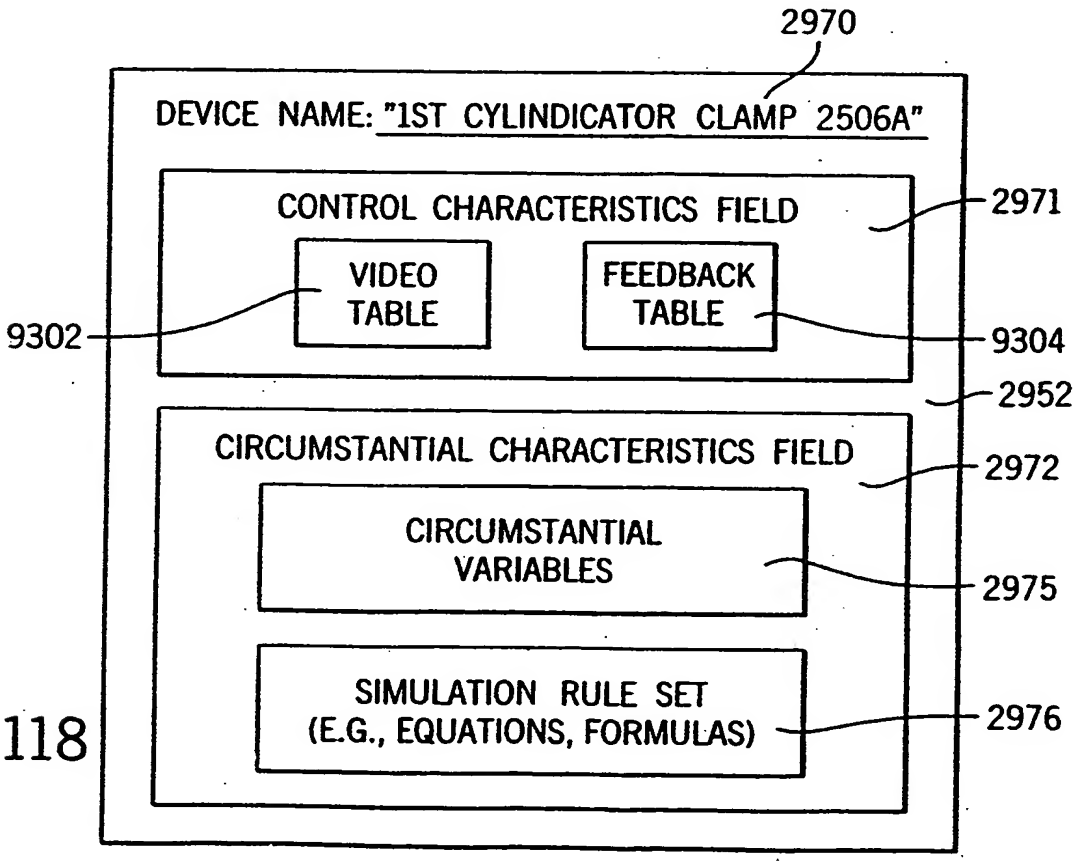


FIG. 118

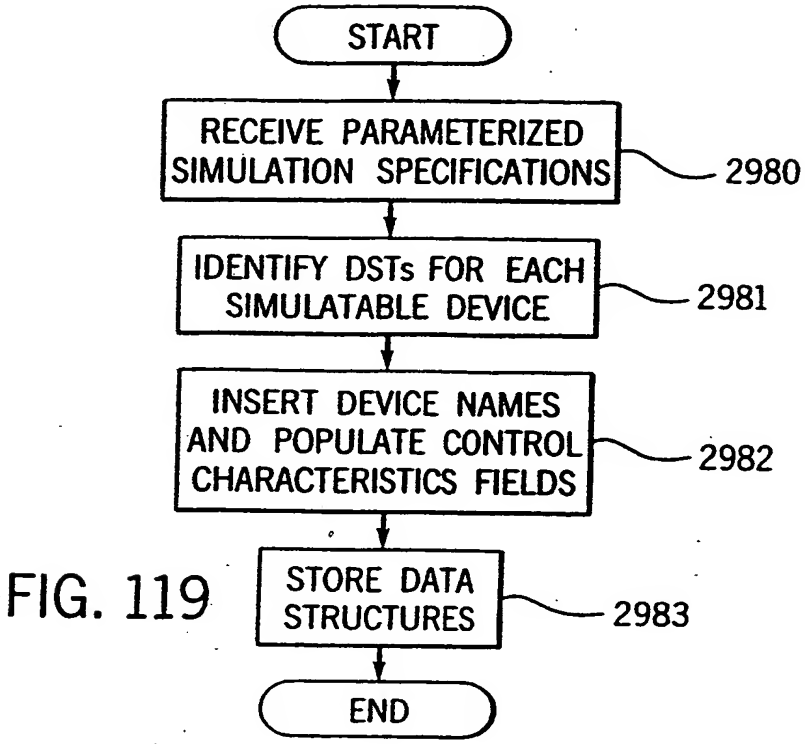


FIG. 119

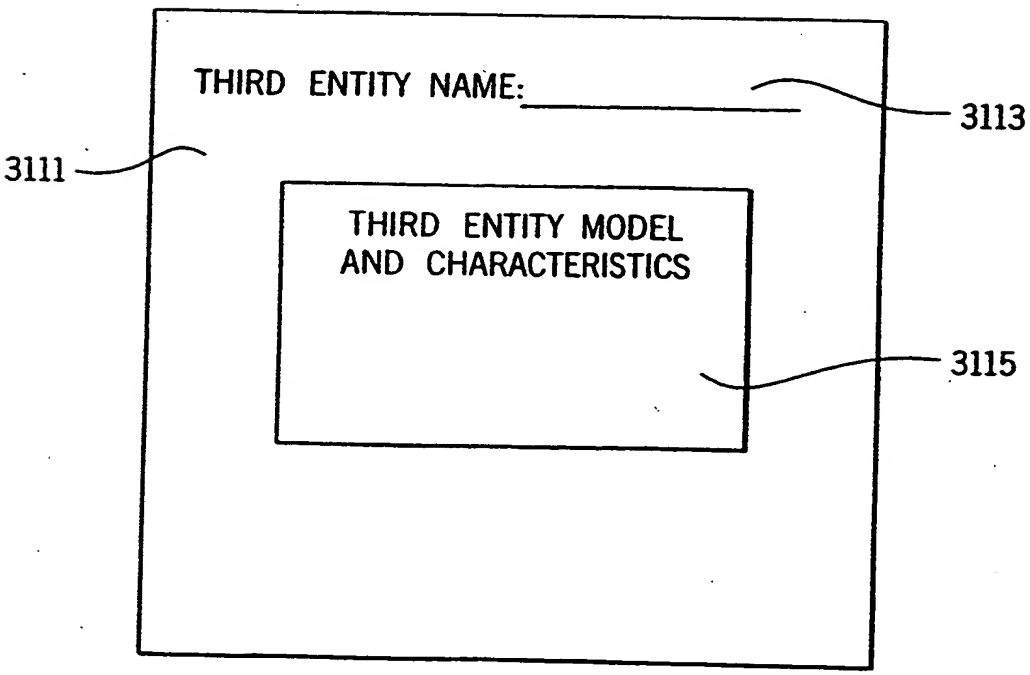


FIG. 121

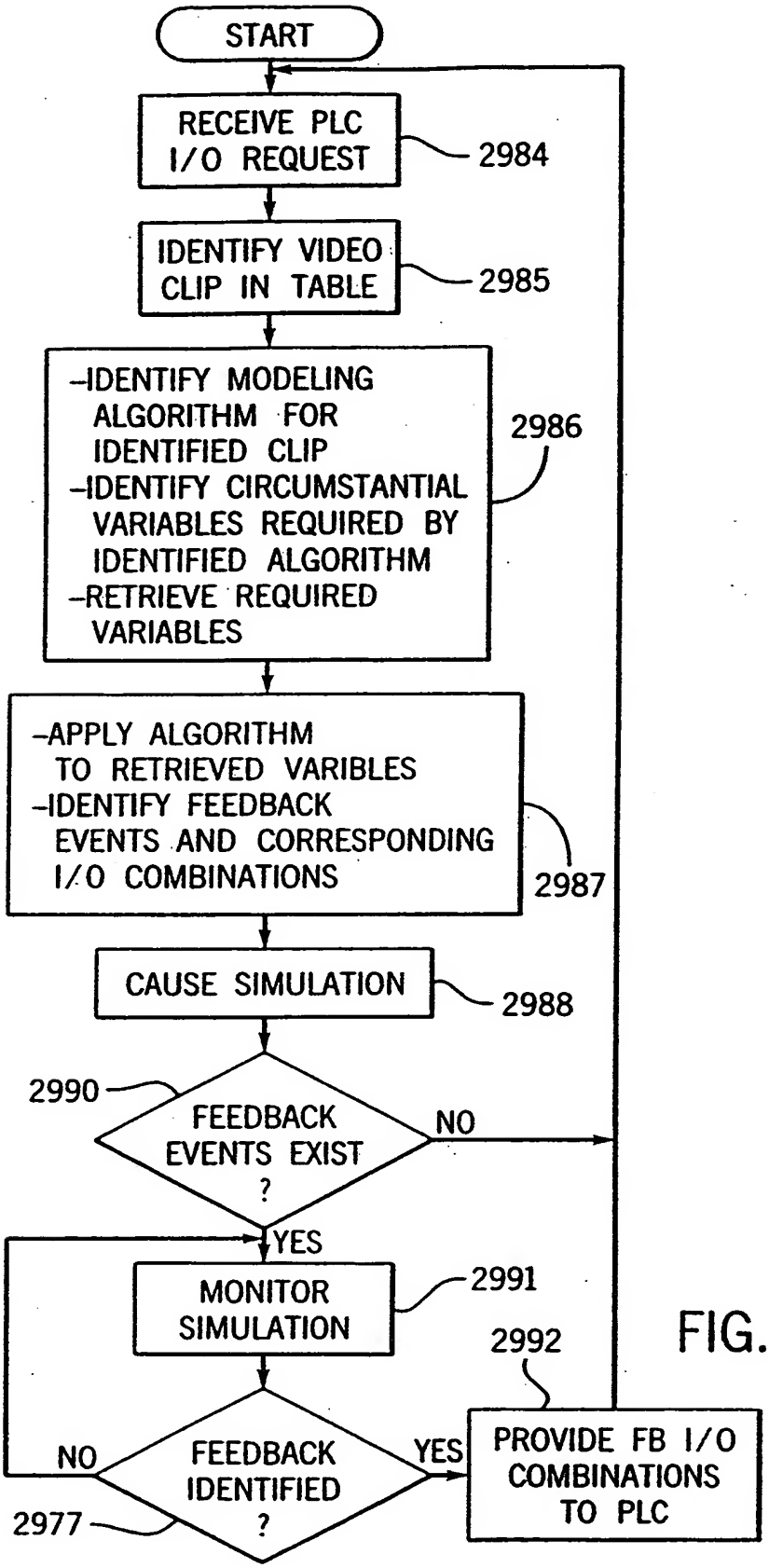

START
RECEIVE PLC I/O REQUEST
2984
IDENTIFY VIDEO CLIP IN TABLE
2985
-IDENTIFY MODELING ALGORITHM FOR IDENTIFIED CLIP
-IDENTIFY CIRCUMSTANTIAL VARIABLES REQUIRED BY IDENTIFIED ALGORITHM
-RETRIEVE REQUIRED VARIABLES
2986
-APPLY ALGORITHM TO RETRIEVED VARIBLES
-IDENTIFY FEEDBACK EVENTS AND CORRESPONDING I/O COMBINATIONS
2987
CAUSE SIMULATION
2988
2990
FEEDBACK EVENTS EXIST ?
NO
YES
MONITOR SIMULATION
2991
2992
NO
FEEDBACK IDENTIFIED ?
2977
YES
PROVIDE FB I/O COMBINATIONS TO PLC

FIG. 120